SPECIAL { THE NATIONAL CAPITAL: ITS PAVEMENTS AND PARKS, AND ITS FORM OF GOVERNMENT

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SANITATION,
BRIDGES.

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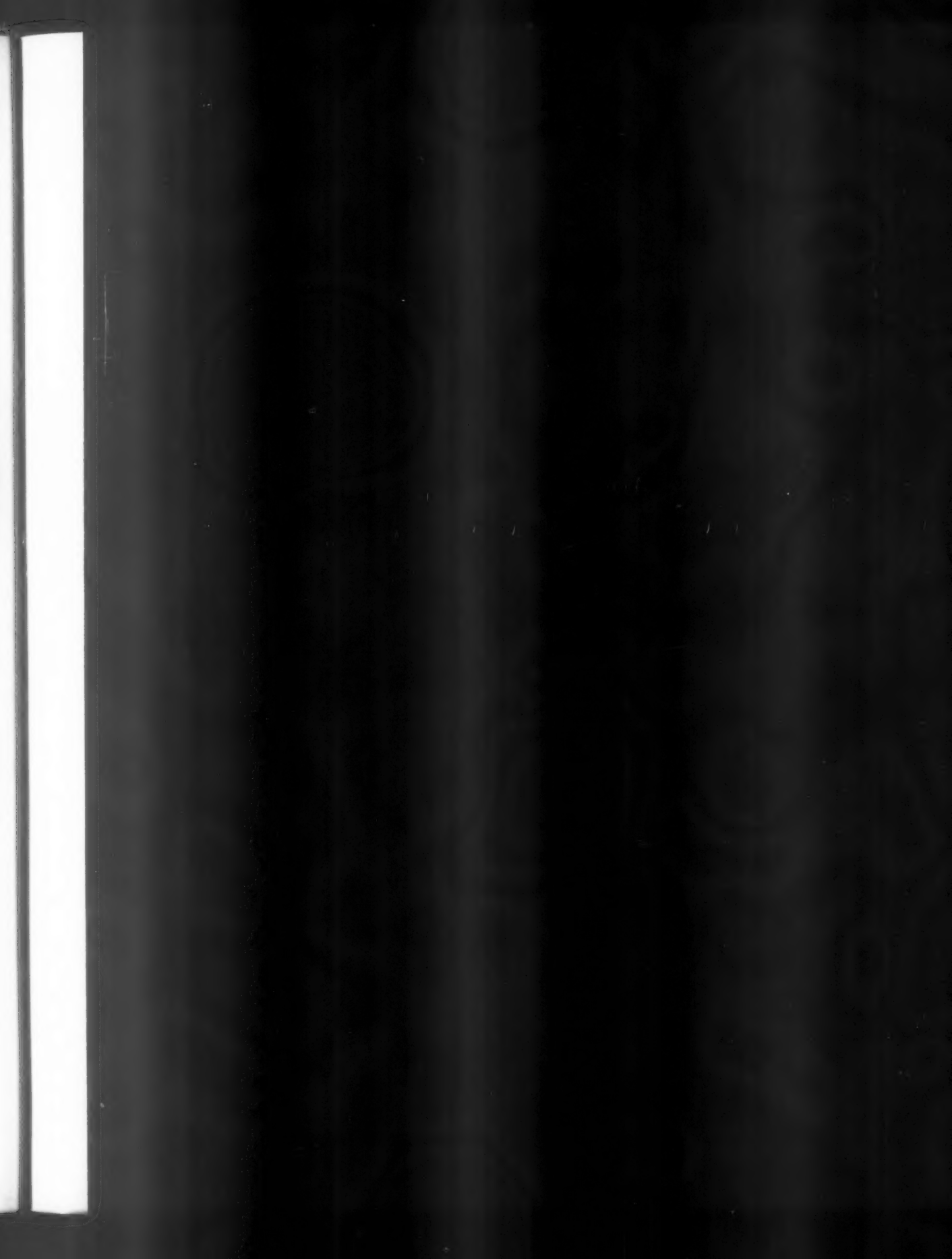
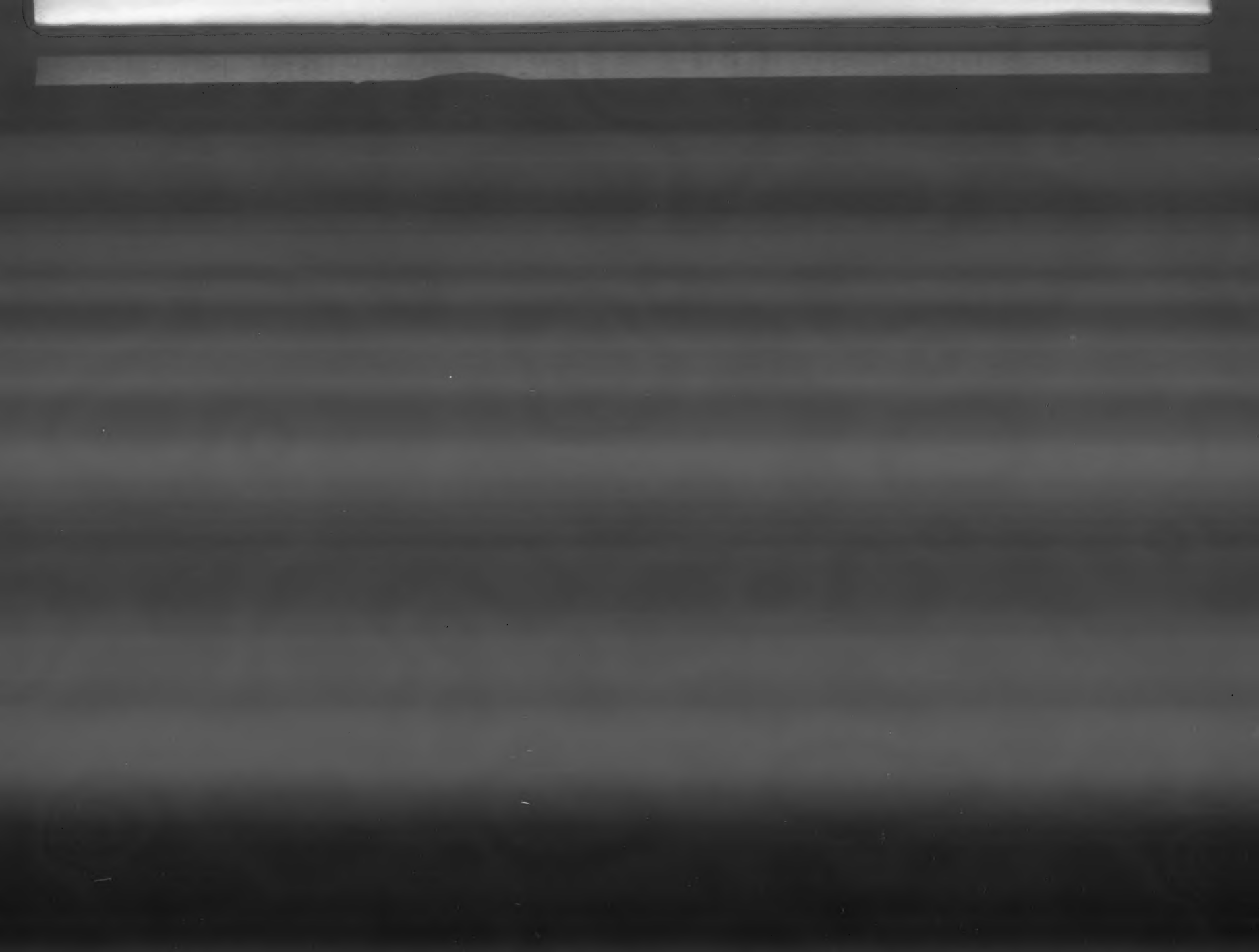




Municipal Engineering

VOLUME XV. OCTOBER, EIGHTEEN NINETY-EIGHT. NUMBER 4.

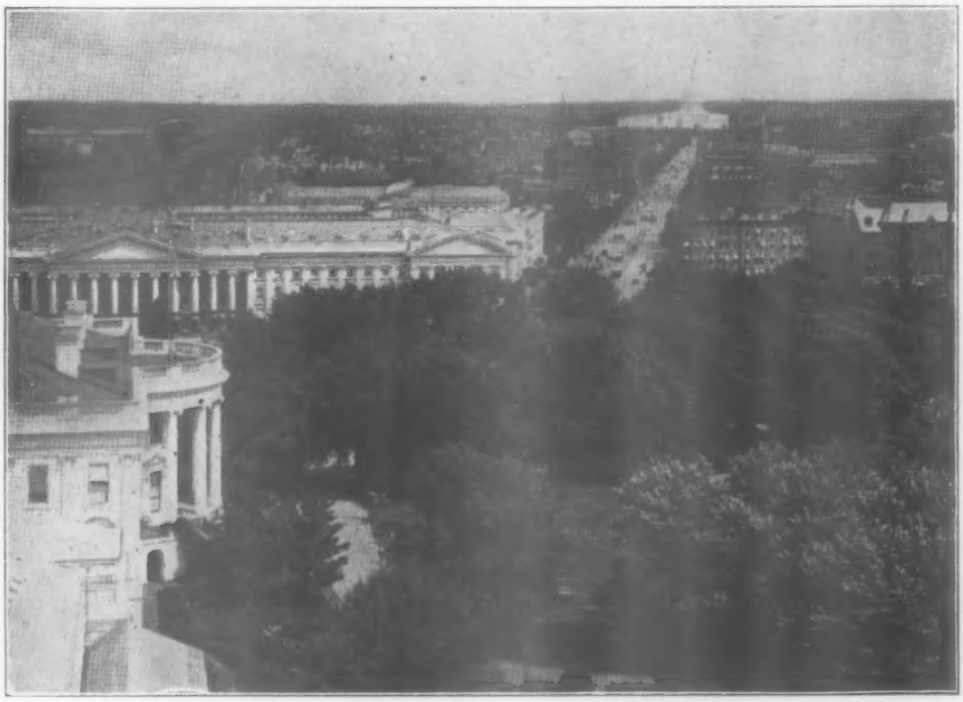
THE NATIONAL CAPITAL: ITS PAVEMENTS AND PARKS, AND ITS FORM OF GOVERNMENT.

The nation's capital will receive close scrutiny from the men who have charge of the physical improvement of American cities when the American Society of Municipal Improvements holds its fifth annual meeting there on October 26th, 27th and 28th. They will find there surroundings which will serve as good examples for much of the discussion in the convention, for in many respects Washington is physically a model city. It pleases the eye, and it is a comfortable place. Its streets are among the finest in the world; the green of trees and grass and shrubbery, and an intermingling of the brighter colors of flowers, spread over the whole city, giving everywhere nature's adorning touch to the improvement wrought by man's skill and genius. Washington will interest those who are striving to improve the public facilities of cities and to make them more beautiful. It is in every way a suitable meeting place for the progressive men who have under their charge this important work.

Washington's form of government stands alone and peculiar in its processes, and has undergone various changes in arriving at methods satisfactory both to the residents of the city and the rest of the country, for the administration of the city is subject to the rule of Congress. After the Continental Congress had convened in eight different cities, and had been well near worn out by the contentions of rival cities for selection as the permanent seat of the federal government, it was decided that it would be necessary to have the capital at a point absolutely under federal control, as complications would be likely to grow out of questions of jurisdiction if it should be located within the province of any state. The states of Maryland and Virginia, therefore, passed acts ceding to the federal government any portion of their territory which it might choose, and each offer was accepted by the selection of land from the two, embracing a total area of one hundred square miles on the Potomac river, which became the District of Columbia. This was divided into two counties, the Virginia portion being called the county of Alexandria, and that given by Maryland the county of Washington. Virginia's grant turned out a sort of Indian gift, as the state asked that the county of Alexandria be returned to its control, and, as congress found that the territory was not needed, the county of Alexandria was, in 1846, re-ceded to Virginia.

The district was first divided into three municipalities, known as the cities of Georgetown and Washington and the Levy Court, the last

named having charge of the territory outside of the limits of the other two. At first Washington was governed by a council elected by the people and a mayor appointed by the president of the United States. Robert Brent was appointed mayor ten consecutive times. Then, for eight years, the city council was allowed to elect the mayor. This proved unsatisfac-



REAR OF WHITE-HOUSE. WHITE-HOUSE GROUNDS.
TREASURY BUILDING. CAPITOL.

A VIEW OF PENNSYLVANIA AVENUE FROM STATE, WAR AND NAVY BUILDING.

tory, and for fifty-one years the residents of the district were permitted to biennially elect a mayor. In 1871, however, congress substituted a new form of government, consisting of a governor, a board of public works, a board of health, and a secretary, all of whom were appointed by the president, together with eleven members of a council, but the resident voters were allowed to elect a house of delegates, with twenty-two members, and were also accorded the privilege of electing a representative in congress. "This consolidation of the local governments was brought about chiefly through the imperative demand for public improvements," says Mr. Clifford Howard, one of the secretaries of the present commission, in an article in *The Californian*. "The city of Washington had been laid out on such an elaborate and extensive plan, that the citizens, with their own unaided resources were utterly unable to cope with it. The streets and avenues, broader than those of any other city in the world, and occupying nearly fifty-five per cent. of the city's total area, were all very grand in conception, but woefully shabby in reality, since the city had not the means where-

with to pave their wide surfaces and grade their immense lengths. And so, for years, the capital was obliged to remain what Charles Dickens satirically styled 'a city of magnificent intentions,' and what we, in more forcible language called 'a national disgrace.'

"When, however, certain enterprising Westerners undertook to advocate the removal of the capital to St. Louis, as a point more nationally central, and, as a further powerful argument in behalf of their strenuous efforts, referred to the unsightly, inchoate condition of Washington, its citizens very naturally bestirred themselves to avoid the calamity of being thus robbed of their dignity and distinction, and the result was the establishment of the territorial form of government. Although this new form of administration enjoyed but a brief life, it so far sufficed to carry out the much-needed public improvements as to bring about that wonderful transformation which attracted the attention of the entire nation and gained for its authors a world-wide notoriety.

"The first governor, Henry D. Cooke, was enabled through the financial reputation of his firm—Jay Cooke & Company—to secure the immense sums required to make these improvements, which were directed and supervised by Alexander Shepherd, then executive head of the board of public works and afterwards governor. Thanks to the energy and perseverance of these two men, seconded by the enterprise and encouragement of its wide-awake citizens, Washington, from a forlorn, aimless town, became in a short space of three years a city worthy of being the capital of a great nation, and thus averted the doom which St. Louis would have wrought upon it. The condemnatory clamor, however, that arose on all sides against the vast expenditures and liabilities incurred for this exercise of the magician's wand precipitated the downfall of the territorial government in 1874, and the inauguration of a temporary administration under the immediate supervision of three commissioners appointed by the president of the United States, congress having come to the conclusion that the people of the district were not capable of judiciously managing their own affairs. In view of previous experiences it is probable that this paternal form of administration was thus temporarily established as an experiment, as it was not until after a satisfactory trial of four years that it was permanently adopted by the establishment in 1878 of the present and fifth form of government.

"This present local government of our capital is a municipal corporation embracing the entire territory of 72.09 square miles, ceded to the United States by the state of Maryland. In addition to Washington, the district contains the city of Georgetown and a number of villages—notably, Anacostia, Brightwood and Tenallytown. The city of Washington contains about ten square miles, and is laid out in accordance with the plan prepared by Major Pierre Charles L'Enfant, a French engineer, whose skill during the revolutionary war attracted the attention of General Washington, who honored him with the commission of designing the national capital. The plan is a systematic and altogether a very unique one. The city is divided into four sections, the northwest, the northeast, the southwest and the southeast, the capitol forming the central point of division. The streets run directly north and south and east

and west; the former being numbered in numerical order and the latter named after the letters of the alphabet in regular sequence. It is necessary, however, to bear in mind the location of the street, since every street is repeated (or is supposed to be) in each one of the four sections, and hence the reason for appending to Washington addresses the initials 'N. W.,' 'S. E.,' or whatever the particular location may require.

"The avenues, which are named after the states of the Union, cross the city diagonally in different directions, many of them radiating from the capitol, some from the White House, and others again, like Massachusetts and Rhode Island avenues, claiming no central point, but stretching their broad, beautiful paths across the city in defiance of any fixed plan. Nearly every intersection of each one of these avenues with a street is beautified by a reservation or open space, ranging in size from a small, triangular grass-plat to a spacious, shady parking, while the intersections of the avenues with one another are marked by large circular reservations, very properly called "circles," each of which, with the exception of Iowa Circle, is named after and adorned with the statue of some notable American. Thus, at the intersection of Massachusetts and Rhode Island avenues is the imposing statue of General Scott, while at the Massachusetts and Connecticut avenues is that of Dupont, standing erect in the center of a beautiful parking. In addition to his many other memorials, George Washington is also honored with a statue and circle at the conjunction of Pennsylvania and New Hampshire avenues, while General Thomas, with his hat in hand as though acknowledging the admiration of the public as they gaze upon the finest equestrian statue in the country, adorns the juncture of Vermont and Massachusetts avenues. In addition to the smaller parkings, and as a geometric and artistic offset to the

OFFICES OF THE DISTRICT GOVERNMENT.

circles, there are other reservations as represented by Franklin Park, Judiciary Square, Lafayette Park, Farragut Square, Garfield Park, Mount Vernon Square, McPherson Square, Lincoln Park and Stanton Square, with their giant trees, their splashing fountains, their shady paths and knolls, their gardens and their appropriate statuary. Not only is the stranger captivated by the rural loveliness and the verdant charms of the nooks and parks that greet him at almost every turn, but each street is in itself a park, a sylvan lane, with its rows of wondrous shade trees, whose graceful, wide-spreading branches, in many instances, meet above the roadway, forming exquisite vistas, which stretch away into dreamy woodland, or form the charmed, umbrageous entrance to some resplendent park. For miles and miles in many parts of the city every dwelling, from the lowly hut of the negro to the palace of the millionaire, has its private parking or front yard, with vine-covered terraces and porches, with trees whose foliage mingles with that on the sidewalk; with rare shrubs and flowers, and fountains whose sprinkling mist transforms the slumbering sunbeams into dancing, iridescent sprays. Looking from the top of the monument on a morning in early June, when nature revels in the glory of her renewed life, Washington lies beneath the beholder with its glistening church-spires, and tall buildings of shining marble, and the deep red brick of the lofty domes and towers peeping above the mass of virescent foliage. Here and there may be seen the grand avenues as they stretch their splendid lengths across the city, while along its edge the broad Potomac, dotted with the shadowy forms of boats and vessels, wends its mighty way toward the ocean in slow, sluggish roll.

"The statues are not confined wholly to the squares and circles, but many, like that of Benjamin Franklin, cast their shadows upon the noisy street, or like that of John Marshall, keep their silent, stolid guard before the portals of some great building. Probably the most interesting of these apotheosistical monuments is the colossal statue of General Jackson in Lafayette park, immediately facing the White House, and made from the brass of old cannons captured by him. Here 'Old Hickory' is compelled to sit forever on a horse raised on his haunches, with no other support for his massive self and his heavy rider than his hind legs—a feat in statuary which the learned world said could not be performed until Clark Mills, like Christopher Columbus, demonstrated that the world does not always know everything. A statue of Lafayette has recently been erected at the southeast corner of Lafayette park, the only monument to a foreigner in the city; and, therefore, an honor of which the French people may justly feel proud."

Mr. Howard's interesting article in *The Californian* becomes quite enthusiastic on the subject of the streets of Washington. "Notwithstanding that the capital was laid out a century ago," he says, "when city thoroughfares were ostensibly designed for the purpose of allowing neighbors to shake hands across the street and of losing themselves around the corner, the streets and avenues of Washington are without their equal at this day, and we may well marvel at the audacity which prompted so elaborate a design so many years ago. Next to the capitol, whose resplendent dome looms up on the horizon for

miles before the visitor reaches the city, the streets are the first feature to attract his attention by reason of their great length, their unusual width, their multitude of shade trees and their smooth asphalt driveways, over which the rapidly-moving vehicles glide with a quietness and ease at once astonishing and delightful to one accustomed only to cobble-stones and dusty roads. So smooth are these pavements that hundreds of children use their parlor skates almost exclusively in going about from one part of the city to another, and it is not difficult to understand how, with such streets, Washington should prove a veritable paradise for its 35,000 bicycle riders. Bicycle riding in Washington is as common a means of locomotion as walking; in fact, everybody is supposed to know how to ride, and nearly everybody does. Here may be seen the merchant wheeling his way to business; the pretty government clerk, with her lunch bag on her arm; the dignified congressman on his way to the capitol, the laughing school boy, the grey-haired grandfather, the postman with his bag of letters, the young girl skimming to school with her books strapped to the handle bars; the ragged darkey boy; the spruce young man, the progressive mother, with her baby tucked into a little seat in front of the machine; the mercurial district messenger, the reporter, the grave clergyman on his way to church and the happy tippler on his way to ruin—all are scurrying along on safety bicycles to their respective destinations, attracting no more attention than do the pedestrians on the sidewalk.

CITY HALL.

"Pennsylvania avenue, northwest from the capitol to the treasury, is the main portion of the principal thoroughfare in the city and one of the grandest avenues in the world. Like nearly all the avenues, it is 160 feet wide, thus equalling in breadth three or four ordinary city streets. To Washingtonians it is familiarly and significantly known as 'the avenue.' All day long it is crowded with a gay throng of men and women, and when, at four o'clock, the departments pour forth their 15,000 clerks, the majority of whom

find their way to the avenue, it presents a most enlivening scene, its great size seeming then hardly sufficient to accommodate the mass of people and the crowd of vehicles passing up and down.

"Washington has its fashionable promenade in Connecticut avenue, from Farragut Square to Dupont Circle, upon which are located the residence of the British legation and the Church of the Covenant. Generally, however, Connecticut avenue is not so beautiful nor so conspicuous for its residences as some of the other streets in the fashionable northwest section of the city where the palatial homes of our senators and millionaires, our famous writers and politicians have given to Washington, in addition to its many pet names, the 'City of Residences.' These hundreds of handsome houses, each one vying with the other in some peculiarity of style, some architectural characteristic, some elaboration of design or some variety of ornamentation, resulting in a city of buildings, no two of which can be said to be precisely alike, and which range in style from the baronial to the most extravagant modern architecture, constitute one of the many characteristic and attractive features of the national capital. With these ornate peculiarities—its broad, shady streets, its gardens, its parks, its homes and its public buildings, and withal its freedom from any of the disagreeable and unsightly features incident

ASPHALT PAVEMENT ON M STREET, BETWEEN 8TH AND 9TH STREETS, N. W., LAID IN 1878, SHOWING CONDITION TWENTY YEARS AFTERWARD.

to a commercial or mercantile center—Washington is a city of which all may well be proud. * * *

"The water supply of the district is obtained from the Potomac river by means of an aqueduct about twelve miles long and nine feet in diameter. This portion of the supply system is under the charge of a United States officer, who sees to it that the aqueduct is kept in repair, and that the settling and distributing reservoirs are properly cared for, while the commissioners attend to the furnishing of water to the citizens, who, in turn, testify their appreciation of the excellence of this conjunct system by daily consuming 35,000,000 gallons of water, or about 150 gallons a day for every individual. In 1882 Congress became impressed with the idea that it was essential for the welfare of the people that the water supply of the district should be increased, by the construction of a subterranean aqueduct about four miles long, through solid rock, from a distributing reservoir beyond Georgetown to a reservoir with an estimated capacity of 300,000,000 gallons, to be constructed in the northeastern section of Washington. After expending over two and a half million dollars in the prosecution of this extravagant design—one half of which the expectant citizens were obliged to pay—the work was abandoned because of certain complications, and Congress contented itself with having a four-foot water main laid instead, and, with its usual thoughtfulness, did not neglect to charge half the cost thereof to the disgruntled taxpayers."

IOWA CIRCLE

The affairs of Washington, under its present government, are administered by a board of three commissioners, namely—John B. Wight, John W. Ross and Capt. Lansing H. Beach, two of whom are appointed by the president from among residents of the district, and the third is detailed from among the corps of engineers of the army. All other officers and employes of the district government are appointed by these commissioners. It is the custom of the commissioners to elect as president one who represents the dominant party, but he is vested with no authority not exercised by his associates, except that he officially signs documents for the commission. The work is divided among them, each having charge of certain departments of municipal affairs. Under the latest assignment of the business and offices of the district government Commissioner Wight has immediate supervision of the following departments: Inspection of boilers, chimney sweeping, inspection of coal, ex-officio trustee of Columbia Hos-

pital for Women, coroner and assistant coroner, board of dental examiners, druggists to the poor, excise board, fire department, inspection of flour, inspection of food, collection and disposal of garbage, hack stands, harbor master, hay scales, health office, insurance companies, liquor licenses, inspection of lumber, markets, including Hay Market square; board of medical examiners, care of municipal building, transportation of paupers, physicians to the poor, commissioners of pharmacy, police, disposal of police rewards, poundmaster, board of control of Rock Creek Park, sealer

DUPONT CIRCLE.

of weights and measures, board of examiners of steam engineers, surgeons of police and fire departments, veterinary surgeons, telegraph and telephone service, inspection and measuring of wood.

Commissioner Ross—Almshouse, Asylum Hospital, Washington; assessments of general taxes and special assessments other than water assesssments and rents; assessor; assistant assessors, board of; attorney's office; attorney, special assistant; auditor's office; bathing beach; claims vs. the District of Columbia; charities, superintendent of; charitable and reformatory institutions receiving aid from the district government; collector of taxes; disbursing officer; dog tags; insane, commitments of; library, free public; licenses, other than liquor; gauger and inspector of spirituous liquors; municipal lodging house; property clerk; public schools, board of trustees of; reform school (boys), trustee of; Rock Creek Park, board of control, president of; sweeping and cleaning streets, avenues and alleys; tax sales; work-house.

Commissioner Beach—Asphalt and cements, inspector of; bridges, engineer of; buildings, inspector of; chief clerk, engineer department; computing engineer; conduits; contracts, preparation and record of; electrical engineer; elevators, inspector of; fire escapes; gas and meters, inspector of; highway extension plans; lamps, superintendent of; lighting, street, gas and electric; parking commission; parking, supervision of; parking, superintendent of; pavements; permit clerk; plumbing board; plumbing, inspector of; plumbers, examination of; property, superintendent of; river front; roads, superintendent of; Rock Creek Park commission; Rock Creek Park, board of control; sewers, superintendent of; sidewalks; stables, engineer department; street railways, supervision of; streets, superintendent of; subdivision of land; surveyor; telegraph and telephone lines; trees; water department, chief clerk and registrar; water department, superintendent of; wharves.

The engineer commissioner is assisted by two other officers from the engineer corps who also are detailed for this duty by the president. Neither of these officers receive pay from the district. The engineer commissioner receives only so much as will, with his pay from the army, make his compensation $5,000 per annum, the salary paid to each of the other commissioners.

Much of the work is done

through the secretaries. The secretary of the commission is Dr. William Tindall, who has held the position since the creation of the commission, and prior thereto was secretary to Mayor Bowen, Governor Cooke and Governor Shepherd during the entire term of each. The assistant secretary is Mr. Clifford Howard, to whom we are indebted for much of the information in this article. He is a native of Pennsylvania, is twenty-nine years old, has been in the District

HARRISON VAN DUYNE,
President American Society of Municipal Improvements.

service for nine years and is well known as a writer. The other secretaries are Mr. Frank C. Roach, with President Wight, Mr. Francis Nye, with Commissioner Ross, and Mr. Moncure Burke, with Capt. Beach.

The people of Washington share equally with the federal government the cost of municipal administration in the district. In addition to their general taxes cost of laying water-mains is paid by abutting property owners at the rate of 1¼ cents per square foot and one-half the cost of a sewer or an alley or sidewalk pavement is charged against abutting property. The license charges embrace nearly all kinds of business. All revenues, when collected, are turned over to the treasurer of the United States, who acts as treasurer of the district. The total expenditures on account of the district amount to about $6,000,000 annually.

The members of the American Society of Municipal Improvements will be specially interested in the pavements and parks of Washington. There has been longer experience in Washington with asphalt paving than in any other city in the country. The first asphalt pavement was laid there under the supervision of a special commission, and some of the men who have become most prominent in the business obtained their first experience there. Gen. Francis V. Greene, now president of the Barber Asphalt Paving Com-

pany, was once engineer commissioner of Washington. The scientific knowledge of asphalt paving has been largely developed in the engineering department of Washington, and Mr. A. L. Barber, the founder of the business, started there. Capt. Beach, the engineer commissioner, is in charge of the local arrangements for the convention of the American Society, and will do all in his power to make the meeting instructive, as well as pleasurable. Information regarding the arrangements for the meeting will be found elsewhere in this number.

ASSESSMENT FOR SEWERS AND WATER MAINS.

By Charles Carroll Brown, M. Am. Soc. C. E.

The questions regarding methods of assessment for sewers and for water mains have usually been considered separately, but from nearly every point of view they are similar and the conclusions reached are based upon the same principles. The commercial side of water-works, with the fact that they are frequently owned by private companies, has perhaps tended to conceal their close connection. The location and construction of sewers is taken entirely out of the hands of the property owners in many cities and in some states, a power to veto the expenditure being the only power, if any, left to them. In few cities is this true regarding water pipes.

As our cities increase in number and size the difficulty of securing pure water supplies increases and the private well or other such supply must be condemned, so that but one source can be used. Sewer and water systems then are both sanitary appliances of the city and must be equally under its control. Whatever improves the condition of the city is of general benefit to all its citizens and should be paid for from city funds raised by general taxation. No small portion of the total cost of both sewer and water systems should be assigned to the city at large. Thus in the sewer system, disposal works, outlet sewers, intercepters, those portions of main sewers which serve in part as either, may be made a general charge, or in part a general charge and in part an assessment upon the drainage district benefited; and in a water system the reservoirs, stand-pipes, pumping plant, supply mains, and perhaps some portion of the larger distributing mains should be treated in the same way. The proportion to be so assessed will depend upon the relative cost of these portions for common use and the distribution or collection systems.

Local sewers and water mains are mainly of direct benefit to the adjoining property. In the case of sewers the construction is the main expense and the cost of cleaning is so generally distributed over the entire system that it is usually made a city charge. The first cost is the only amount to be assessed upon the property therefore. In the case of water supply the laying of mains is but a small part of the total expense. Many lines are laid through streets where the property is not yet improved and their presence is a direct enhancement of its

value, as well as of the value of property already improved. Perhaps the direct assessment of the actual cost of the main is as equitable a method of assuming this increase value as any. In case the main is a large one intended to supply a large district, a portion of its cost should be assessed upon the entire district, or paid from the city treasury, leaving the estimate cost of say a 6, 8 or 10-inch pipe to be assessed on the property.

The cost of supplying water through the mains is practically proportional to the amount of water supplied, and this is properly assessed upon the consumers by meter rates or flat rates so fixed as to approximate as closely as possible to such a proportion the cost of fire protection and water for public purposes to be paid by the city.

The common methods of assessing the cost of sewers are by frontage, by area and by valuation, with some instances of assessing for the number and size of connections. Unquestionably the sewer is a direct benefit to the property, whether improved or not, by its simple readiness for use, and a part of the cost should be assessed directly upon the property in proportion to its frontage, or perhaps better, its area, as in the case of the cost of construction of water pipe. The use of both water and sewer systems being compulsory for the system of assessment under consideration, another portion of the cost is just as much proportional to the amount of use made of the system as the cost of furnishing water is. This use must be estimated in most cases. Only for new systems in districts already populous or in reconstructions can such an assessment be made directly. A definite schedule of rates for making connections, to be paid when the permit for making connection is issued, would be the nearest to an equitable assessment of this portion of the cost if the city can carry the debt until the property is ready for the connections. Carefully prepared regulations by the health department or other competent authority fixing sizes of connections and regulating and enforcing connections are a necessary accompaniment of such a system. In residence districts the cost of an eight or ten-inch sewer might be provided for in this way. The excess over this cost, being due largely to size necessary to carry off surface water, is a large part of the direct benefit to the vacant lot, to be assessed directly. If the sewer drains a large district, the excess over the cost of a fixed size should be assessed on the district benefited or assumed by the city. If a schedule of rates for connections is impossible, the next approximation is an assessment of this portion according to valuation of property. Such a division may be far from equitable in a new district, as it is impossible to foresee the uses that will be made of the property.

The following cities make some approximation to the methods proposed:

Brookline, Mass., 75 cents a front foot and ¾-cent a square foot on the area of the lot counted 100 feet deep and the remainder is paid by general tax.

Brockton, Mass., assesses 15 cents a front foot, 0.3 cent a square foot on the area of the lot, counted 100 feet deep, a rental of 30 cents per 1,000 gallons of water used and the remainder by general taxation, these being considered to approximate the proportions of one-half rental, one quarter direct assessments by area and frontage, and one-quarter general tax.

The favorite methods at present are by general tax; mains, all, or all except the value of a local sewer by general tax, laterals by assessment on property benefited; storm sewers, general tax, sanitary sewers, local assessment; one-quarter or one-third general tax and the remainder local assessment; local assessment of entire cost; assessment on sewer district of all sewers therein.

PRACTICAL LEGISLATION FOR BETTER ROADS.

By William T. Beatty.

Better roads, not good roads, should be the war-cry of the improved roads propaganda. It is useless to strive after the unattainable. The stone road is the only really good road the year round, and for four-fifths of the country it is, and will be, unattainable for many decades. This is due to several causes, principally, lack of means in sparsely settled communities where stone is obtainable, and lack of stone in large sections of the country that may be either with or without the means of utilizing it if they had it. Better roads are within the reach of all, and the good roads movement, which has hitherto confined its efforts largely to a consideration of the ways and means of procuring, and the methods of constructing, stone roads, should enlarge the scope of its operations by endeavoring to stimulate and assist every community, no matter what the present condition of its roads, to obtain better ones, and just as much better as it can afford, even though stone roads may be far beyond its reach. Volumes have been written and miles of speeches discharged in demonstrating the enormous cost of hauling the country's products to market over mirey, mucky, rutty roads and comparing it with the expense of transportation over hard, smooth, level road-beds. This striking comparison is put forth to the people of the United States as an incentive to construct stone roads. But of what use is it to talk stone roads to the farmers, who are the tax-payers, in the great prairie states where most of this enormous tonnage is produced and where good roads are the most needed? They have struggled along through mud and water during half the year as long as they can remember, with taxes always as heavy as they are willing to bear. If they are approached on the subject, and some more than usually enterprising spirit among them takes the trouble of reducing the proposition to a practical basis, he discovers for their edification that stone of fairly satisfactory quality is obtainable one hundred and sixty miles away; that the machinery necessary to begin constructing stone roads economically will cost about $2,000; that after it is purchased each mile of stone road will cost just twice the amount of the yearly road tax of the whole township. If the community happens to be a particularly progressive one, and, even in the face of such discouraging conditions, evinces a disposition to make a start in a small way, it is immediately confronted with the fact that there is no legal way in which it can purchase the machinery and have its payment distrib-

uted over several years. They must levy the tax and pay the whole amount in one sum. This being more than they are able to bear, puts a quietus on the scheme, and stone roads being out of the question, it is not considered worth the effort to attempt to substantially improve their seemingly hopeless dirt highways, and the whole matter is dropped.

CALHOUN STREET, NEW ORLEANS, BEFORE PAVING.

This is an illustration of conditions that prevail over considerably more than two-thirds of the entire country, and, despite the constant newspaper and magazine agitation that is going on, but little practical good has been or is being accomplished. Good roads are a product of evolution. The bad road must become better before it can become good. The effort to effect a jump from bad to good, without taking the intermediate steps, has not been productive of results. Much has been done in some few parts of the country, to be sure, but it is insignificant compared to what might have been done if systematic, well-directed and continued effort had been going on all over the country to better the condition of the roads without trying to attain an impossible standard. There is as much difference between a well-crowned, properly drained and carefully kept dirt road and the ordinary flat-topped, unditched and rutty country road, as there is between the good dirt road just described and a stone road, and if one-half the endeavor had been put forth to transform these existing miserable roads into a high class of dirts roads that

has been expended in trying to obtain the generally impossible stone road, a vastly improved condition of highways would be in existence to-day. What is needed to bring about this desirable state of affairs is not state aid, but state legislation whereby the people can aid themselves. The idea that is beginning to prevail, that better roads can only be secured by the state engaging to shoulder part of the expense, is an erroneous as well as injurious one. It stifles local effort and retards progress. Wherever it is under discussion, even in the most tentative way, there will be found a disposition to hold back to see what the state is going to do. Officials are reluctant to take the initiative in any movement, and the people hesitate to encourage them, all fearing the expense to be incurred will be thrown away, as by waiting another year or two a portion, or all, of it will be borne by the state.

It is a matter of record that in those few states where state aid is an accomplished fact all progress in road improvement was practically paralyzed for several years prior thereto and the slightest agitation of the subject in other states is being attended with similar results. State aid, however desirable it may be, is unobtainable in many states for years to come for various reasons. In some states the conditions of the road problem radically differ in different sections of the state, rendering it almost impossible to get the people to unite on any effective law. In other states it is unconstitutional and even after the people have been able to agree, the tedious and difficult process of amending the constitution must be gone through with. After all, the inhabitants of the particular district or township improving its roads are the ones who reap nine-tenths of the benefits therefrom and on them the expense should rightly fall.

There is a vast difference in the standards of civilization as well as in the financial standing of different sections of the same state. Some communities are far in advance of others, they are ready for better roads now they realize the need of them, appreciate the value of them and are prepared to stand the cost of them, provided some method of defraying the cost can be provided whereby its payment can be distributed over several years and not come with crushing weight in a single immediate payment. The initial cost is the obstacle that blocks the road. Better roads, of whatever sort, mean road machinery. If it is replacing dirt roads with stone roads, it means substituting earth handling machinery with stone road machinery. If it is exchanging the old worn-out channel that has done duty as an apology for a road for a high class drained and graded earth road, it means substituting the pick, shovel, plow and scraper of past ages with modern, highly improved earth road machinery. On this feature the history of every branch of successful industry is significant.

America has attained her prominence in all departments of manufacturing, agriculture and transportation by taking the lead in their mechanical development. She has multiplied the product of her physical force above her competitors by producing and utilizing more effective machinery and by so doing has passed them in the race for industrial supremacy. Just such a lesson must be learned in the road improvement industry before it can take the place it should have in the country's industries. If road

taxes are already as high as the people will bear, the only way to improve the roads is to improve the methods of building and preserving them. In so doing the people will at the same time be educated up to a higher plane where they will begin to realize that any increase in taxes that brings a commensurate improvement in the roads is an actual investment, paying dividends in added valuation to properties and lessened expense for transportation. This improvement of the roads without increasing the outlay can be accomplished only by the employment of high class road machinery such as is made especially and used successfully for that purpose. In no department of machinery have greater results been realized in recent years than in road machinery. It now comprises a large line of modern, effective implements, the capabilities of which, in the line of their work, will astonish the unitiated.

A township raising and spending a thousand dollars a year on its roads finds them growing yearly worse, if such were possible; at all events it finds absolutely no improvement in their condition from year to year. Let such a township provide itself with one thousand dollars' worth of modern road machinery and apply its yearly revenue of a thousand dollars to keeping the machinery in operation under intelligent management. It will find its roads can be brought up to the highest standard of ex-

CALHOUN STREET, NEW ORLEANS, AFTER PAVING WITH ASPHALT.

cellence possible for dirt roads in a marvelously short time, and can be kept in that condition. It will also find its improved dirt roads so far in advance of those it has come to consider inevitable that it will find difficulty in recognizing them. Or, let a township in which stone abounds, but has never been used on the roads, and which spends two thousand dollars a year on its dirt roads, invest two thousand dollars in machinery, fifteen hundred dollars in stone road machinery and five hundred dollars in earth road machinery. It could then apply half its revenue to building stone roads and the other half, by the use of machinery, would maintain and improve the dirt roads. It could go on adding to its stone roads from year to year until its main roads were all stone, for the people will voluntarily add to the revenue after experiencing the effects of the better road.

Tracts, pamphlets, magazine articles, speeches, etc., reach a certain class, but are slow to act on the farmer who is the main factor in this problem. He is suspicious of new methods and new notions and especially so when they savor of new taxation. Until he is fully convinced he will avoid all risk by voting "No." Let him once have the use of one-half mile of good stone road, kept in good repair, for a year and he will do a lot of thinking every time he strikes that road and it will be thinking to a purpose. After one or two rainy "spells" he is a convert and needs no more good road talk for himself. He becomes a missionary in the cause and discusses ways and means.

But how are these townships going to procure this machinery? The roads require constant attention to keep them even passable and a year's revenue can not be diverted to its purchase. In a large majority of the states there is no law under which any purchase can be made and paid for in installments running several years. Any attempt to stretch or strain the laws, even for so desirable a purpose, can and has been repeatedly upset by some single obstreperous and unconverted citizen. What is needed is legislation of the local option order, whereby a majority of the taxpayers in any township or district could petition their road commissioner to purchase certain necessary machinery at a stated price, payable in a stipulated number of yearly installments, at the legal rate of interest, no payment exceeding one-half the yearly revenue of the township or district making the purchase. Under such a law the township with the one thousand dollar revenue could buy a thousand dollars worth of machinery on five years' time, payable in five annual installments of two hundred dollars each and interest. There would be no increase in the taxes and the remaining eight hundred dollars applied each year to operating the machinery would be productive of far greater results than the whole thousand dollars without the machinery. Or, a road district with an annual revenue of one hundred dollars could purchase two hundred and fifty dollars worth of machinery on five years' time and have the best roads its money could make instead of the poorest. By this method it would be impossible to saddle on the township or district any undesirable debt, as it requires action by a majority of the taxpayers. At the same time it enables a progressive and enlightened majority in any community to accomplish its purpose, which at present can not be done.

Legislation on this order would be productive of much greater immediate results than any plan involving a general system of state aid, which is sure to meet with bitter opposition for many years. With such a law the advanced communities will forge rapidly ahead and practical object lessons in good roads will spring up all over the state. This will bring about a condition of rivalry between counties and townships that will be of the greatest assistance in furthering the good cause and the retarding influences of the chronic obstructionists that reside to some extent in nearly every locality will be minimized. They will not be able to hamper action by the majority as they do now. In addition to such legislation, in all those states where the term of office of road officials is only one year, it should be extended to at least three years. It takes one year for the incumbent to become familiar with the duties of his office and to acquire the experience necessary to its proper conduct and, if an officer is competent to hold a position at all, his second and third year in office will be of far more value to his constituents than his first and should be free from the entanglements of a yearly election.

A COMPARISON OF THE COMBINED AND SEPARATE SYSTEMS OF SEWERAGE.

By C. P. Collins, C. E.

Of the three essentials to human life, air, water and food, the one which should be specially sought is pure water. Vigor is essential to the advancement and happiness of every individual, and strength and happiness of the people are essential to good public morals, good public government and sound public prosperity. Sanitary improvements are therefore among the first and chief duties of public officers and guardians, and should ever be the objects of most earnest thought to those in whose charge and under whose directions these improvements are furthered.

No town or city can submit to a continued want of an adequate supply of pure water, without a serious check in its prosperity. Most foul and fearful of all the artificial pollutions which ignorant and careless humanity permits to reach the streams are the drainage of cesspools, sewers and stable-yards. The man who permits his family to use water impregnated with fecal substances, that the bodies of other persons or animals have already excreted, and the authorities who permit their citizens to use such waters, open for them the gates to aches and pains, and weakness of mind and body.

There is no community, there are few families and comparatively few animals, without disease. In very large communities there is rarely a time when some virulent disease does not exist, and unless the excretions from such source are properly disposed of, much trouble must be expected and many lives must pay the penalty of this sad neglect.

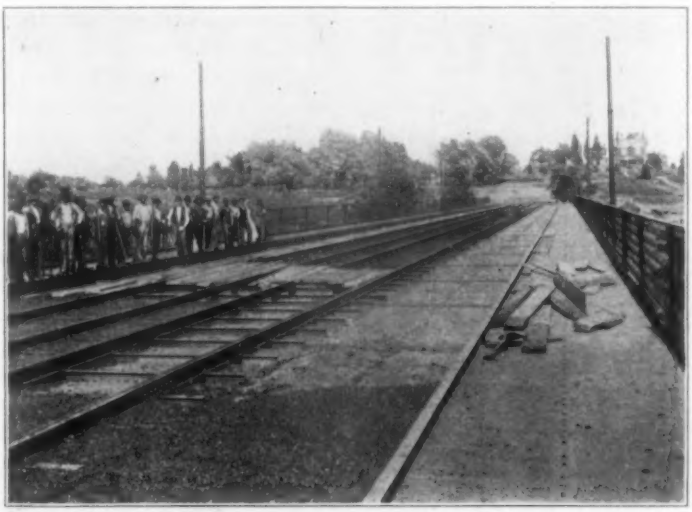
First and foremost for the health of any community is a carefully arranged system of sewers whereby these deadly enemies to

mankind may be speeded away to points where they can do no harm.

Engineers themselves who have spent their lives in sanitary work differ widely as to the best plan to pursue, and rarely any two men will wholly agree on some of the most vital points. The methods of sewage disposal usually adopted may be spoken of as crude disposal, disposal by irrigation and filtration and disposal by chemical precipitation.

Crude disposal contemplates discharging the sewage in its crude or unclarified state into some near water-course or body of water. This is usually by far the cheapest methods of disposing of the sewage, and where the flow of the stream or body of water is large enough to sufficiently dilute the sewage crude disposal may be admissible.

Irrigation and filtration through land consists in discharging the crude sewage upon the ground, the coarser material being left on the surface while the finer portion passes into the earth to a greater or less depth, depending upon the coarseness of the soil. The water, freed from the matter in suspension, descends still further into the ground, coming in contact with the air in the earth. The impurities which it contains are therefore oxydized, that is, purified by the action of the bacteria, dependent for life upon oxygen contained in the air. The purified liquid may descend still lower, or it may be carried off in underground drains, laid for that purpose. The insoluble matter contained in the soil is also oxydized by slow combustion and thereby reduced to a fine powder and mingles with the elements of the earth.



FIRST COURSE OF BITUMINOUS CONCRETE ON WEST EIGHTH STREET VIADUCT, PRICE'S HILL, CINCINNATI.

There is a distinction between irrigation and filtration. In irrigation only so much sewage is applied as will be beneficial to vegetation. In filtration the quantity applied is governed by the amount the soil will purify, regardless of the effect on the growing crop. Different soils differ greatly in their power of purifying, coarse, sandy, or gravelly material being much better than that which is fine or more compact.

In irrigation the prime object more often is the profit that may be derived from the crops raised. In irrigation a much larger area is needed to dispose of the sewage than when filtration is practiced.

Chemical precipitation consists in collecting the sewage in tanks, having just previously mixed with it certain chemicals, the result of which is to precipitate all matter in suspension and the portion of the material in solution. A semi-fluid mass collects at the bottom of the tank, called sludge, which may be drawn off or pumped into beds to drain or dry out.

THE COMBINED SYSTEM.

The combined system is one with which all towns are more or less familiar. It consists of a single set of sewers, calculated to receive and carry away a certain portion of the storm water flowing on the surface and all the house drainage and industrial waste produced along lines of streets where sewers are laid. Mechanically considered it performs all these offices in a satisfactory manner and seems to comply with the leading requirements of purely engineering considerations.

It prevents sidewalks and streets from being overflowed during ordinary storms and generally disposes of the surplus water, clean or foul, with a considerable degree of completeness. But let us see if there are not some defects in this method of disposal, even though some of the larger cities in this country have adopted the combined plan and consider it the most economical and practical one. In order to provide for the removal of storm water the sewers are made larger than is required for house drainage only, so that during an interval between storms, the stream which would be ample to keep the sewer properly flushed were the diameter small, is spread out over a larger surface and loses its power to keep it clean. The sewer being large, its air-space is large and ordinary methods of ventilating fail to change its contents with sufficient frequency to prevent the formation of foul gases. The drainage from the streets carry into the sewer foul rubbish of every sort which remains deposited there to a greater or less extent. These deposits form a nucleus for further accumulation of putrefaction from the solid matter of house drainage leading to a great foulness of an unfrequently changed atmosphere, thereby requiring the house communications to be carefully trapped, less they deliver foul and infective air into the interior of dwellings.

As combined sewers are made so foul in this way it is also of great importance that their atmosphere be trapped away from the streets and also that the amount of foul deposit may be reduced; it is necessary to keep street rubbish out of them and thus their inlets from the gutters are shut off by trapped catch basins. This becomes the receptacle of sand, straw, chips, mud and droppings from the street forming together, especially in warm weather, a polluted rotten mass, a source of local infection and the dangers thereof are manifest to all.

The whole tendency of modern investigation is to show that the zymotic diseases are produced by bacteria, whose germs are developed under favorable conditions. It is well known that the most favorable conditions for the growth of these low organisms are heat, moisture, darkness and presence of ammonia. The damp walls of sewers present therefore all the requirements for

the most abundant growth of these bacteria whose germs may float off on the sewer air and be carried into dwellings, by mechanical action, as dust is borne into our windows.

Large sewers necessarily become the hot-beds for the propagation of these deadly organisms, the moist porous walls forming a good soil for this pestilent growth and the ammonia from the sewage supplies the nutriment essential for their development, the damp, moist and warm air completing the process.

a coating on them, as the flow decreases.

The velocity of the stream being great, enough power is gained to carry along with it particles of solid matter which, as the stream subsides, are deposited along the water line of the sewer; these deposits form miniature dams at first, but are greatly enlarged by the constant addition of solid matter from house drainage, which, during the dry weather, leave not sufficient depth of flow to carry them on.

COMPLETED ASPHALT BASEMENT ON WEST EIGHTH STREET VIADUCT, PRICE'S HILL CINCINNATI.

The storm water falling per hour in violent rains over an area of closely built up city land is nearly fifty times the amount of waste water and sewage produced per hour in the same area. The sewage therefore is a mere trickling thread in the bottom of a sewer, large enough to carry off storm water.

Let us suppose the sewer in question to be one built of brick. In time of rain the sewer will be nearly or quite full of diluted sewage, which is absorbed by the bricks, and leaves

Foul gases are then emitted, and it has been popularly assumed that these gases (called "sewer gas") are the cause of disease.

The occasional flushing of these large sewers, while it may clean out silt and accumulated filth, and thus decrease the amount of heat and ammonia from decomposition, can never prevent the growth of bacteria on the sewer walls, nor will ventilation prove efficient. Every device of engineering has been exhausted to keep large sewers clean and well ventilated, but the air

from them is still deadly. Experience, therefore, has taught and is teaching that there is some radical defect in the system of large or combined sewers. Perfect plumbing may prevent sewer-gas from entering dwellings, but perfect plumbing is the rare exception, especially when a landlord foots the bills. In view of these facts, are we not forced to conclude that the "Combined System of Sewerage" is defective, if not an utter failure as far as sanitary requirements are concerned?

Each and every town has, as a rule, certain requirements to be met, when a system of sewerage is to be devised, which should regulate the choice of the best method to pursue. Naturally great attention should be given to the question of economy, and, other things being equal, economy should control. At the same time other things are seldom equal, and, in some cases, economy, i. e., engineering economy, or the first cost of construction, without reference to the value of the result, should be placed as secondary in importance.

Where the special requirement is to dispose of a surplus of surface water during storms, this object should be in precedence of all else, yet the sanitary requirements must not be forgotten.

All sanitarians are agreed that the chief aim, as far as the removal of foul waste is concerned, whatever may be the system adopted, should be immediate and complete, and this principle of immediate and complete removal should apply to all laterals, as well as main sewers, and be a universal requirement.

THE SEPARATE SYSTEM.

Let us now turn attention to the "separate system." In this method the chief aim is to separate the house drainage from the surface drainage, and storm water, where it is necessary to be carried off in conduit, is disposed of through special storm water sewers.

By this separation much smaller sewers will suffice for the house-drainage, and on this account the flow through them will be more constant, and there will be less chance for deposits, and less wall surface will be exposed, on which bacteria can germinate, and there will be less space for storing up germ-ladened air. The gases and heat of decomposition, which so powerfully stimulate the growth of organic matter, are prevented by thorough daily flushing, which is only possible in small sewers. The smooth glazed surface of the pipes is unfavorable soil for this vegetable growth, compared with the porous bricks, moistened with sewage.

So much smaller sewers will suffice to carry off the sewage only that their cost need be but a fraction of what would be required to build sewers admitting rain; and by adopting the former, many towns can avail themselves of the benefits of sewerage, which would otherwise be prevented, by this extra expense. Comparing the cost of the sewers of Chicago with those of Memphis, the estimated first cost of the combined system proved to be 2½ times that of the separate system, not admitting rain.

In places of moderate size the accumulations of storm water can be led by short and inexpensive drains, directly to a suitable outflow, without being taken in artificial channels over a longer course; and it applies to a greater extent than is generally supposed to large cities.

Since the separate system underwent its first test at Memphis in

1880 and from that time on has been known as the "Waring System of Sewerage," it has been adopted by at least sixty towns and cities, and the results are most favorable.

Mr. Chas. H. Latrobe, C. E., of Baltimore, referring to the separate system, says: "The introduction of roof or yard water, with the amount of rubbish of one kind or another, which it always contains, and the air in state of a greater or less compression, which is always carried down the roof-leaders, is simply the introduction of a disturbing element, which renders the smooth and regular action of the system a matter of impossibility. Storm water introduced into the system can cause great trouble by the introduction through back-pressure of noxious and dangerous gases into the houses connected with the system, whilst during long-continued droughts the dead ends of the system would become foul for want of frequent cleansing. Again the use of flushing tanks, by the regularity and frequency of their discharge, and by the large body precipitated into the dead end of the sewer, sweep out with one rush any chance of accumulations of filth."

The flush caused by the introduction of rain water through sewers is constant, and wholly dependent upon its intensity. The flush from an automatic flush tank is sudden and violent.

Considering 1 inch per hour as a maximum rainfall, from the roof of a house 25 feet x 50 feet in size, or 1,250 square feet in area, there would flow 104 cubic feet or 780 gallons in one hour. The flush tank discharging 160 gallons into the sewer in 55 seconds, which was the average capacity of those used at Memphis, would have great advantage over the former; for, while the roof discharges 780 gallons in one hour, in 55 seconds it would discharge 12-$\frac{37}{100}$ gallons. So, even in most violent rains, the discharge from about thirteen buildings of the above dimensions, would be necessary to equal that of the ordinary flush tank.

A VIEW OF RACE STREET, CINCINNATI.

Engineers and sanitarians are inclining more and more to the belief that it is rarely, if ever, expedient, to dilute sewage with storm water and to befoul storm water with sewage, in the attempt to remove both by the same underground channel and neither now doubts the absolute impropriety of applying this system to small cities.

While a foul and ill-ventilated sewer is always a source of danger and much worse than none at all, a well planned, well built, well used, well ventilated and well flushed sewer, approaches very near to sanitary perfection.

PARK BRIDGES.

By Oscar Sanne, Mem. W. S. E.

I think the more our country is settled and people commence to enjoy life and look more for an æsthetic development there will be a growing demand for a combination of engineering skill with highly artistic achievements.

During the last five years I have designed and built for the Lake Park of the city of Milwaukee several ornamental bridges. Starting with a simple foot bridge, built as a viaduct over a very picturesque ravine, I have gradually developed a system of park bridges which are not only strictly engineering structures, but which have been very carefully laid out with the view of obtaining the most pleasing artistic effect.

To obtain this result it is necessary that the engineer, being entrusted with such an unusual task, should carefully study everything about the laws of beauty when applied to construction. To show a steel structure in the most beautiful harmony of its details is often more difficult than to solve the most complicated mechanical problem. This kind of engineering work can not be done in a rush or by the thumb rule, but requires careful and thorough study of every detail; all proportions must be well weighed, so that a pure harmony will prevail in the whole as well as in its parts.

The development of the artistic side of the engineering profession meets to some extent with difficulties which the architect does not experience. The latter has any amount of very excellent examples from ancient time; they form the very best guides for him and with their help his way to highest perfection is comparatively smooth. Not so with an engineer. There are very few examples of important engineering structures where the lines of beauty play such a prominent part; our way of construction has been changed so very remarkably that hardly anything now can be compared with the construction of ancient time.

Construction in steel and iron, for instance, has been developed to such a high degree of practicability, based upon such profound scientific principles, that the engineer of our days is in a position to solve most any problem, and yet how little attention is paid to the artistic effect of any of the more important structures, which are not always located in the midst of the wild prairie, but very often in the heart of our larger cities, and which are without question examples of the highest engineering

skill, but which bear only too often testimony of a very poor and sometimes vulgar taste.

We very often hear the argument that those structures shall only answer the requirements of utility, any ornamentation or beauty being considered a waste of money and time. This seems to me a very short-sighted argument. Even a bridge, for instance, well designed and laid out with care and due attention to harmonious effects, will make a noble and pleasing impression, and does not generally cost more than a bridge simply constructed according to a strain sheet without the slightest attempt to produce pleasing proportions and harmony of details. Such a structure may call forth admiration for the bold designer, but will never appeal to our sense of the beautiful.

What is required to improve on our present designing of bridges and similar structures, in order to make these structures of most attractive character and artistic appearance, so that such a structure would be a precious treasure for the noble and beautiful surrounding, is, in the first place, that the designer takes the necessary care, love and thoughtfulness in working out a design in harmony with itself and its surroundings. Not too much time can be spent on a drawing board, if the designer is called to bring forth even in an engineering structure the fullest harmony and purest lines of beauty. It takes study to find out why certain ornamentation is wrong, or why a line of construction is just the right thing for the sake of beauty. It should be the duty of every student of engineering science to develop, besides his judgment for correct design, a taste for beauty in a structure. That personal gifts play a great part in this requirement is undoubtedly true, but in our day there are plenty of men of talent who never get a chance to develop these precious gifts and their sense of beauty is gradually dying away.

My endeavor has been to create structures in our Milwaukee Lake Park which are in full harmony with the beautiful and superb lay out of this park, which in time to come will be one of the handsomest in this country.

Not only has nature given us the most attractive and picturesque scenery along magnificent Lake Michigan, where beautiful ravines change with rich meadows, bordered with majestic groups of the finest species of forest trees, but careful and thoughtful landscape engineering has assisted nature in bringing forth the most magnificent park that can be found anywhere.

The first three bridges built during the years 1892 to 1894 are shown plainly in Figs. 1, 2 and 3. They are noble-looking structures, showing the greatest harmony in their proportions. The foot-bridge, Fig. 1, is not very richly decorated, but considering the limited amount available can be classified among the handsomest of its kind.

This bridge is composed of two 30-foot and one 50-foot plate girder deck spans; the girders are thirty inches back to back of angles; this depth was considered the most effective one with regard to graceful appearance. The girders are placed twelve feet nine inches center to center, leaving a walk of twelve feet clear between handsome iron railings; the bridge has two bents of ornamental cast iron columns well-braced. The abutments are made of well-bonded limestone masonry, with a very effective ornamental hand-railing of terra cotta on top of coping. The contem-

plated flower vases and lamp-posts, as shown on the design, will greatly improve the appearance of this bridge.

The cost of this structure was as follows:

For the masonry and terra cotta railing	$1,398 45
For the iron work	1,274 00
Total	$2,672 45

My total estimate was $3,000.

The second bridge, Fig. 2, is a fifty-foot steel arch. This bridge

FIG. 1.

carries the park driveway over a very picturesque ravine.

It is composed of six 50-foot steel arch ribs, very thoroughly braced; the front ribs are very effectively ornamented by a cast iron ornamental cover. The four inner ribs

FIG. 2.

are made of four 3 in. x 3½ in. x ⅜ in. angles and one 18 in. x $\frac{5}{16}$ web plate; the two outer ribs of four 3 in. x 3½ in. x $\frac{5}{16}$ angles and one 18 in. x ¼ web plate. The ribs were calculated and constructed as arches with two hinges; they were figured for a live load of one hundred pounds per square foot plus the dead load. The floor was figured for the same load. In addition to same a ten-ton roller was assumed.

The roadway is twenty-six feet wide, resting on a floor support of I beams and buckled plates. The roadway is composed of about six inches concrete, on top of which are laid five-inch asphalt paving blocks. The sidewalks are seven feet wide resting on I beams, and are made of three-eighth inch cast iron plates with diamond face. A handsome handrailing thoroughly connected to the outside girder helps greatly to the pleasing effect this bridge produces.

The abutments are of the U shape, with very heavy buttresses for each arched rib. A handsome terra cotta handrailing is placed on the top of coping. The appearance of this bridge will be greatly improved by putting the handsomely designed

flower vases and lamp-posts in their proper positions. The cost of this bridge was as follows:

Masonry and terra cotta	$5,786 00
Iron work	4,265 65
Roadway floor and sidewalk	769 83
	$10,821 48

Estimated cost was $11,200.

The third bridge, Fig. 3, is a thirty-five-foot brick arch over a very beautiful ravine. The ornamental parts of this arch were made of terra cotta, also the face stones of the arch proper. The arch is made of five rings best sewer brick, laid in Milwaukee cement. The face of the spandrel and wing walls were laid with handsome brown-face brick.

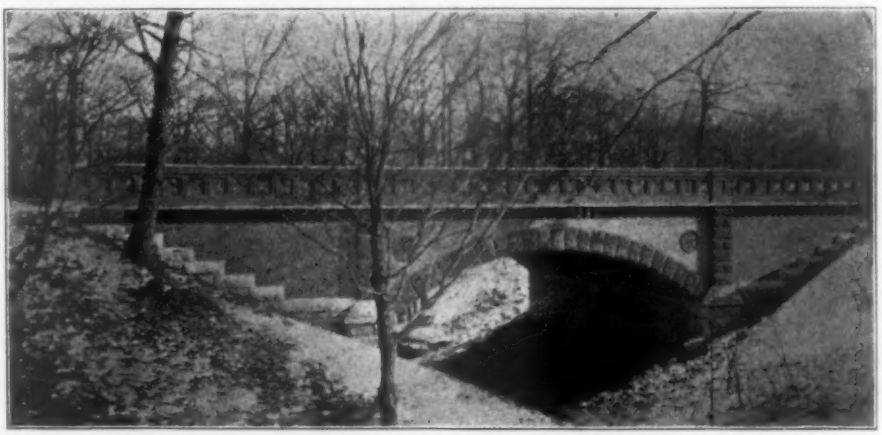


FIG. 3.

The sidewalks, six feet wide, are made of concrete, and the roadway, twenty-six feet wide, of macadam. A fine ornamental handrailing of terra cotta gives this structure an elegant finish. This bridge will also be greatly improved in general appearance as soon as the lamp-posts are in place. The total cost of this bridge, which was let in one contract, was $10,449. Estimated cost, $10,800. The most attractive and highly artistic of all the bridges in this park, however, are those located near the government light-house, crossing two of the most picturesque ravines, with a fine view over the magnificent bay of Milwaukee. These bridges form the main entrance to Lake park and are located in the most desirable residence property of the city of Milwaukee.

It was, therefore, very natural that these structures received the greatest care and attention as to proper harmony in their details. It required a great deal of study to give them the most attractive and artistic appearance, and I may add that only the desire to create something worthy of admiration by lovers of art was the principal motive that guided me in the design of these bridges.

After a careful investigation of the peculiarities of the location, with due consideration of economy and utility, I concluded that the most satisfactory solution of this problem would be the adoption of an arch bridge.

LETTERS FOR THE PUBLIC.

THE SEWERAGE PROBLEM IN BALTIMORE.

To the Editor of Municipal Engineering:

Your editorial on Baltimore sewerage in the September number of MUNICIPAL ENGINEERING puts our situation here, generally, in its true light. It should be remembered, however, that the greater part of the domestic sewage, excepting that from privies, finds its outlet, as in Santiago, by way of the street gutters.

The present situation is this: After an elaborate study of the case, the sewerage commission reported last November recommending disposal by dilution in Chesapeake bay. This brought about so active an opposition from those interested in the oyster trade, through fear of damage to their business, if not of actual injury to the oyster, that it failed to secure the indorsement of a special council committee appointed to consider the matter. The same commission was, however, requested to continue its investigations and report on the best plan which would provide for the purification of the city's sewage.

This subject is now under consideration, and it is hoped that before long the commission will be able to submit a second report, which will not only meet with approval by our people, but will provide for purification at a not unreasonable cost.

The "harbor nuisance" has brought out a great deal of discussion relative to sewerage, some of which, as you have indicated, is very amusing. But at the same time it has served to bring the necessity of some action before the people more effectively, perhaps, than would any number of reports by engineers. As long as they have that horrible stench in their nostrils, the citizens realize that a screw is loose somewhere and, naturally, each man of an ingenious turn of mind sets forth his particular remedy.

It is true that, while ashes, night-soil and garbage are systematically removed, street washings, gutter drainage and occasionally vegetable refuse and dead animals find their way to the harbor. Nevertheless, the principal source of pollution is the discharge of private sewers and storm drains (which carry, as you have pointed out, domestic sewage) into a harbor in the very heart of the city, which is practically without the benefit of a current. The result in hot summer weather is, as might be supposed, a very offensive condition, which is noticeable at times throughout the business section of the city. So active are the processes of putrefaction carried on that the bay steamers painted white one day are as black in forty-eight hours, from the sulphuretted hydrogen evolved, as if they had passed through a fire.

On the whole, perhaps the situation is not without hope that before many more years have rolled around a proper sewerage system will be inaugurated. And when it is, there will be no reason why it should not be exemplary of its kind, for there are no bridges to burn behind it.

Kenneth Allen.

THE CREOSOTED WOOD BLOCK PAVEMENTS IN GALVESTON AND INDIANAPOLIS.

To the Editor of Municipal Engineering:

Since the publication, in your last issue, of my article descriptive of the wood block pavements of Indianapolis, and also of Mr. Kenyon's reply thereto, I happened to pick up an issue of your magazine, dated April, 1895, and find therein an article from J. W. Byrnes, of Galveston, Texas. In this article Mr. Byrnes describes the wood pavements of Galveston, and from his description I beg to quote as follows:

"The method of paving here would not, of course, be applicable to other localities. The formation of this island is a pack sand. By flooding with water it can be packed so closely that a loaded vehicle will scarcely leave a track. After thoroughly saturating the ground, we surface the street with forms the contour of the street, and on this grade we lay the blocks closely, as is done with brick or asphalt blocks. The interstices are filled with close, clean and dry sand. The surface is rammed until the interstices are filled solidly with sand, and the surface smooth and even to conform to the contour of the street. The surface is then flooded with coal tar, liquified by heat to a sufficient degree to penetrate the sand joints, which is then followed by a second coating of paving cement, or thick mixture of asphaltum and dead oil. The surface is then covered with sharp sand and the pavement is complete. * * * Our blocks are cut from yellow pine, five inches thick, five and six inches deep, and from six to ten inches long. * * * The required amount of oil (creosote) for paving blocks is twelve pounds to the cubic foot."

Inasmuch as these blocks are of considerably different dimensions from those of the Indianapolis pavements, which are but four inches deep and wide, and as the foundation is entirely different, and as the interstices between the blocks of the Indianapolis pavements are not carefully rammed with a mixture of sand and tar, I submit that there can be no fair comparison made between the wood pavements of Galveston and those of Indianapolis. A wood pavement made of creosoted blocks after the Galveston method, and of such large blocks, might perhaps be a better one than those in Indianapolis.

It is probable that the sand base spoken of serves to conduct away the moisture which otherwise would accumulate in the blocks and produce results similar to those noted in the Indianapolis pavements.

F. A. Hetherington.

CONCRETE AGGREGATES.

To the Editor of Municipal Engineering:

The use of concrete for every kind of construction has become so general that the quality of the materials of which it is made is a matter of great importance. Specifications prepared for this purpose invariably call for broken stone, to the exclusion of other materials. I find that many persons, who have not given the subject proper consideration, contend that the com-

pound is complete whereby stone, regardless of its quality or texture, enters into the mass. I will here state that as much care should be taken in the selection of the aggregates, stone and sand, as in that of cement. The stone should be perfectly clean and free from flour and dust. The fragments should possess angular faces and be graduated as to size. The theory that limestones contribute to the strength of the mortar with which they are mixed and ultimately produce stronger concretes, is incorrect. The limestone will invariably produce a concrete that can be termed as tough, but never attains extreme hardness, which is essential in all constructive work. I have also found that concretes prepared from limestone aggregates are much more liable to expansion than other stones. The irregular faces and sharp edges of broken stone are not all the advantages in the composition of concrete. It is essential that the aggregates should vary in size, so as to form a wedge with each other, and thereby permit of being properly compacted by ramming. Care should be taken to exclude long, thin fragments, which invariably crush under pressure or break in ramming the mass. The best concrete is obtained by using at least two sizes of broken stone, smaller than the largest aggregate. This fact can be readily demonstrated by mixing the stone and placing it in a heap, when the resistance to ramming will be apparent. The use of one size stone is liable to produce arching, even when the presumption is that the concrete has been properly rammed. When preparing concrete I have frequently used screened gravel with equal parts of broken stone. I have found its oval surfaces pack more closely in the interstices of the stone. To sum up the matter, a variety of shapes and sizes in the aggregates are essential for the ultimate strength of concrete.

I would therefore recommend that a percentage of the stone aggregates used in concrete be proportioned into at least two sizes, under the largest aggregate.

Warner H. Jenkins, C. E.

THE QUESTION DEPARTMENT.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

CHARGES OF DIFFERENT CITIES FOR FIRE HYDRANTS.

The recently adopted water rates of the city of Columbia make a charge of $30 per annum for each fire hydrant on private premises and three cents per sprinkler head of automatic sprinkler systems in addition to the meter rate. This charge is intended to cover the value of fire protection alone. Are our rates higher than the average? Can you give some actual figures?

Chas. C. Wilson, City Engineer
Columbia, S. C.

Two years ago MUNICIPAL ENGINEERING gathered a large amount of data regarding water-works, much of which has been published in various numbers of the magazine. From the unpublished portion the following information is taken:

Omaha pays $84 for the original hydrants and $60 for those since added.
Alpena pays $80 and $40.
Columbus, Ga., $80 and $75.
Elkhart, Ind., $75, $50 and $40.
Fort Worth, Tex., $100 and $50.
Memphis, Tenn., $80 and $50.
Leavenworth, Kan., $75.
Atchison, Kan., Ottumwa, Ia., and Hastings, Neb., $60.
Birmingham and Montgomery, Ala., pay $55.
Eau Claire, Wis., $54 and $44.
Cedar Rapids and Dubuque, Iowa, Superior, Wis., Kansas City, Kan., and Lexington, Ky., $50.
Topeka, Kan., $50 and $46.66.
Newark, O., $48 and $45.
Streator, Ill., $45 and $35.
Waco, Tex., $40, $35 and $30.
Akron, O., and Newburyport, Mass., $40.
Johnstown, Pa., $37.50.
Denver, Colo,, $35.
Clinton, Hyde Park and Pittsfield, Mass., Kingston, N. Y., Nashua, N. H., Providence, and Woonsocket, R. I., $30.
Elizabeth, N. J., and Manchester, N. H., $25.
Burlington, Vt., Chicopee, Newton and Springfield, Mass., Hartford, Conn., Milwaukee, Wis., Pawtucket, R. I., $20.
Plainfield, N. J., $15.
Lowell, Mass., $12.
Mahanoy City, Pa., $10.

All these are for fire protection. It will be noted that the high prices are found in the west and south and the low prices are nearly all in the east.

Some of the works mentioned are of private ownership, but most of them are public works. For some the charge is that made to the city for fire protection and for others it is the charge for private fire hydrants.

The rate fixed by Columbia is a reasonable rate, judged by the standard of the table, and is much below the average rate. The main question arising is whether the city should charge anything for the hydrants, since they are for fire protection, which is usually considered as a general charge on the system to be paid from city funds or from the profits of the operation of the works. If the hydrants are placed on private property, and more or less removed from the direct inspection and control of the city, undoubtedly some charge should be made to cover the cost of laying and maintaining the pipe, and the cost of water used for other than fire purposes, if an additional charge is not made for fire protection also. A meter could be inserted to keep track of unauthorized use of water, provided a sealed bypass is put in, the seal to be broken and the gate opened in case of fire. If this is impossible some such rate as $30 will probably be found satisfactory. Local circumstances must determine the exact rate.

As regards automatic sprinklers the usage is still less uniform. Quincy, Ill., charges $50 to $200; Dubuque, Iowa, $100 to $150; Kansas City, Mo., $6 to $100; Kansas City, Kan., $5 to $75; Bay City, Mich., $15 to $50; Memphis, Tenn., $50; Kingston, N. Y., $30; Minneapolis, Minn., Newark and Plainfield, N. J., $25; Cedar Rapids, Iowa, $20; Baltimore, Md., and Hastings, Neb., charge meter rate;

Columbus, Ga., and Moline, Ill., charge 5 cents for each sprinkler head. All the foregoing charges are per annum.

Burlington, Vt., requires only payment for the connection.

Eau Claire, Wis., and Nashua, N. H., make no charge if the owner of property is a regular consumer of water at contract rates.

Albany, Elmira, Rochester and Troy, N. Y.; Augusta, Ga.; Battle Creek, Grand Rapids and Detroit, Mich.; Des Moines, Iowa; Evansville, Ind.; La Crosse and Milwaukee, Wis.; Manchester, N. H.; Philadelphia and Reading, Pa.; Rockford and Streator, Ill.; Rutland, Vt.; Lowell, Newburyport, Newton, Salem, Springfield and Waltham, Mass.; Pawtucket, Providence and Woonsocket, R. I., make no charge.

A charge of 3 cents a sprinkler head is seen to be very reasonable in comparison with the prices given in the table and to be far below the average. The liability to waste and to unauthorized use of water makes good rates desirable unless meter is used. The meter is only possible if pressure after passage through the meter is ample for sprinkler purposes.

[By J. W. Howard, B. L., C. E., for MUNICIPAL ENGINEERING.]

PAYING FOR PAVEMENTS ON TEN-YEAR PLAN IN INDIANA.

A few cities in New Jersey have a five and ten-year plan for paying for pavements, but a gentleman said Indiana cities had a special system, but referred me to you for the details. Will you please tell me that system of collecting assessments?
W. J. Newhill, Jersey City.

When the board of public works or proper authority have allowed the final estimate of cost of a piece of pavement, the property-owners must begin their ten equal annual payments, either on November first, or the third Monday in April following the date of the final estimate, according as the estimate is made, between October 1 and March 15, or during the other half of the year. Every six months, after the payment of the first one-tenth of the cost and accrued interest, there falls due, alternately, the interest for six months on the unpaid part of the cost and another tenth of the cost, with six months interest. Thus, in the middle of each year, interest only is paid, and once each year interest and principal are paid. The rate of interest is 6 per cent. A person can anticipate all the payments by giving notice.

The city finance department can issue paving bonds for each improved street and use them to pay for the work in advance of the collection of the assessment. The system makes an excellent ten-year payment plan, as well as providing for any less number of payments a property-owner may elect. This Indiana law, known as the Barrett law, is well worth the attention of the cities of other states.

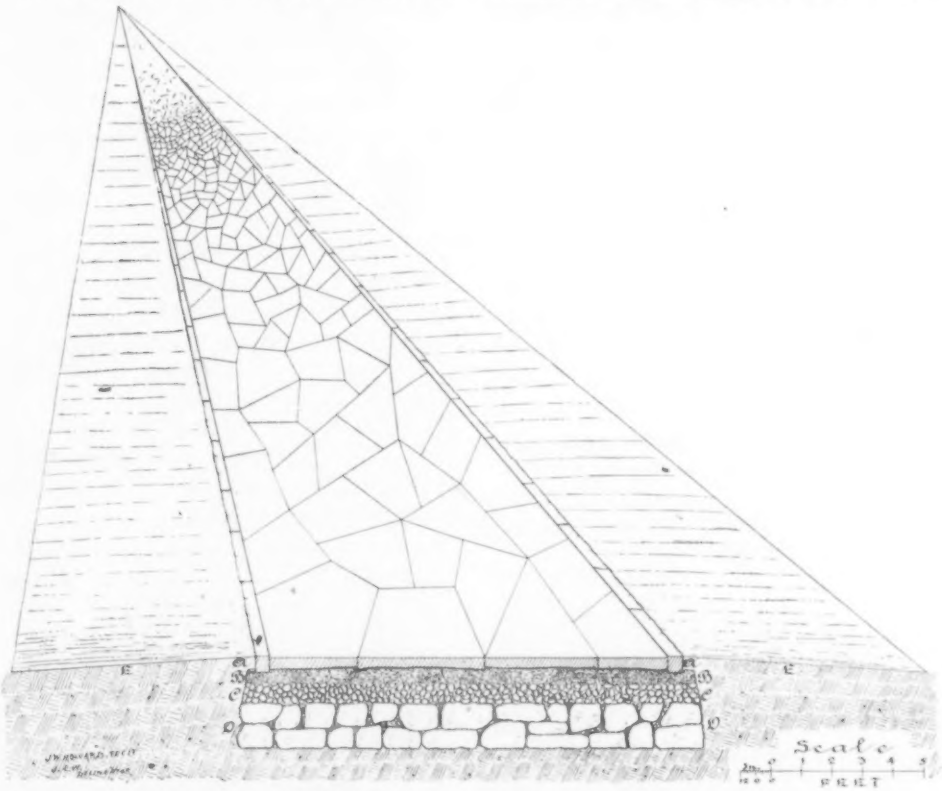
ROMAN ROADS AND THE APPIAN WAY—HOW MADE.

Writers on roads often refer to the Appian Way and to Roman roads, but do not describe how they were constructed. Where was the Appian Way and how were the Roman roads constructed?
Charles Lyman Leighton, Evanston, Ill.

The Via Appia was begun 312 years B. C. by order of Appias Claudius Cæcus. He planned to have it run from Rome to Brundusium, at the southeastern point of Italy (modern Brindisi), 350 miles away. He finished it to Capua, near Naples. It was not finished to Brundusium until more than 200 years later. It was very important because it was the great artery of

travel, commerce and the passage of military forces to Greece, Asia Minor and the Orient. Many portions of the Appian road, as well as other Roman roads in different parts of Europe, are still in use or are used as foundations for modern roads.

The general method of construction of these great roads running from Rome to the uttermost parts of her empire in Europe, but not in



Asia and Africa, was as follows, and as shown in the drawing:

The road was laid out as straight as possible, often too straight, resulting in a few excessive gradients. The soil was removed for about three feet in depth, unless a solid rock bottom was reached at less depth. Except where a rock bottom was found, the road was made of four layers, of a total thickness of three feet. The lowest layer, D–D, about 18 inches thick, was composed of two or more courses of large stones, usually laid in cement mortar. This layer was omitted if solid rock was encountered. The second layer, C–C, about 8 inches thick, was a concrete of various mixed sizes of stones and mortar. The third layer, B–B, about four inches thick, was a well-mixed concrete of small stones and mortar. The fourth layer, or pavement, A–A, was made by fitting together large, even-surfaced slabs of hard stones, of irreglar polygonal forms. Their lower surfaces were parallel, or nearly so, to the upper. The sizes were from several feet across to a few inches, for all were cut to fit closely together, like an enormous mosaic. This fourth layer was laid on the third layer

before the latter was dry, and thus each stone was solidly imbedded. Sometimes the surface of the road was not paved, but simply finished with a fine pebble and cement concrete. At the sides, there were earth walks, about 8 feet wide, for foot traffic in pleasant weather. These sloped outwards.

Some Roman roads are found where clay was used in one or more of the layers, instead of mortar. The width of the paved roadway was about fourteen feet. It is not strange that the foundations of such roads have lasted for two thousand years and are still in use. The paved surfaces become too rough and worn for modern use, and where the old Roman roads are still used, the stone slabs have been superseded by modern macadam surfaces, well laid and well maintained upon the everlasting Roman foundations.

MECHANICAL FILTERS AND SAND FILTRATION.

Is the mechanical filter a success both in filtration and cheapness of maintenance? Are they preferred to sand filters?

T. D. Wheelock, Superintendent Water-Works, Moline, Ill.

The many experiments that have been made recently upon the filtration of water by the two methods mentioned have practically demonstrated that local conditions will determine which method is the better in a particular place when both the results of the filtration and the cost are considered. The question of area is sometimes prominent, the natural filter requiring a much larger area than the mechanical filter. The former is more expensive in first cost under ordinary conditions and the latter is somewhat more expensive in maintenance and repairs. Whether the water must be pumped twice, as may be necessary for the former, or but once as may be possible for the latter, even when pumping under the direct pressure system, must be considered. The degree of purification necessary, and the character of the pollution or sediment which must be removed, including the consideration of sedimentation, are also important questions. It is possible to do equally good work by both systems if the apparatus is properly managed and cleaned, and the mechanical filters are not run too rapidly. It is possible to do equally poor work by both systems if the work is neglected.

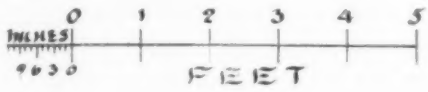
The sanitary and engineering questions must both be considered by expert engineers at the same time as the cost, and for the local circumstances, so that it is impossible to say which system will give the best and cheapest results on the whole until a detailed study of the particular case is made. Do not waste money by employing a cheap engineer. A few dollars saved at the beginning frequently means many dollars wasted in construction, in maintenance, or in inconvenience of operation.

SCALE ON DRAWINGS REPRODUCED BY PHOTOGRAPHY.

We have difficulty in getting our drawings reproduced so that when reduced by a photo-process the reduced measurements will correspond exactly to the numbers showing the scale of the reductions. As MUNICIPAL ENGINEERING often prints cuts to scale, kindly state how you accomplish it. *Superintendent of Water-Works.*

The photo copying processes can, with great care, be adjusted to reduce a drawing to any desired size, and therefore to a scale desired. It is not best to express the scale in feet per inch, or by a ratio, as 1 : 500, on a drawing to be copied either by reduction or even

by tracing and blue-printing. The best way is to draw an actual scale upon the plan, drawing or map. Such a scale is most convenient if made from a zero point by units, inches, feet, miles, to the right of zero and numbered 1, 2, 3, etc. Then place one of these units to the left of zero and subdivide that into whatever number of parts the unit used is usually divided, as ten, twelve, etc., and number these. The figure shows the system:



Such a scale in a drawing will be reduced with the drawing and remain true. Moreover, as blue and other wet printing processes shrink from the original sizes when dry, such a scale shrinks with the drawing and remains correct. In fact paper drawings themselves change with the weather, and a scale drawn upon them is better than one expressed by numbers. The scale is best used by using a strip of paper or the dividers, and at one measurement include the feet to the right and the inches to the left, or whatever the units and its subdivisions may be.

BY WAY OF COMMENT.

Action of Concrete on Lead Pipe.

In making connections and in carrying lead pipes through foundations, it is sometimes very convenient to set them in cement or surround them with mortar. Experiments have shown that this practice is unsafe, for the lime and cement, while different in action, both destroy the pipe. A water pipe will burst, thus showing the location of the weak spot, but gas may escape through openings thus made for a long time before the discovery of the defect is made. Lead pipe in such places should be protected by surrounding it with a stoneware pipe or drain tile, or with asphalt.

Combination Water and Electric Light Plants.

Why are combinations of water and electric light plants in our smaller cities not more numerous? In this class of municipalities neither plant is run to its full capacity, and the lighting plant in particular is idle a large part of the day or is run at a very small percentage of the possible output.

Where both plants are owned by the city the combination is easily made. If reservoir or tank capacity is supplied, the same boilers will answer for both engines, as the pumps can be run when the dynamos are idle. The coal bill will be greater than for the single station, but it will be much less than that for the two stations. One set of firemen and engineers may be discharged. Repairs, attendance, buildings, coal, will all be reduced materially. The only thing which may possibly be increased is storage capacity for water.

When the city owns the electric-light plant and does not own the water plant, a combination is less

readily made, and the same is true if the city owns the water-works and the company owns the electric-light plant.

If it is necessary to run the light plant all the time for a few power customers, a low rate might be made to the water-works to use electric motors, provided they would use their pumps when other power on the line was light. Much can be saved in this case, the only loss from the first case being in the transmission of the power through the electric current. The city should reap a part of the benefit of such an arrangement.

In some cases a combination can be arranged between two companies owning the two plants, if the city is clear-sighted enough to require it in the franchises, but such an arrangement will be thoroughly satisfactory only when one company holds both franchises, and the city is likely to get but little benefit from the economy, unless it is more than usually acute in making its contracts.

The Air-Lift for Deep Wells.

Several quite successful plants for raising water by the air-lift have now been installed and, while the details of the method have not yet been fully worked out, it has been demonstrated that in some circumstances it is preferable to the use of pumps. It is undoubtedly true that the air-lift is much less efficient than the pump, when considered from the side of consumption of steam, but there are other considerations and there are details of practice which offset this difference in some degree. The deep well pump has moving parts which are far out of sight and must be withdrawn for frequent repair, while the air-lift has no moving parts and needs few repairs if properly designed and constructed. An absolutely straight well is not demanded for the air-lift. It seems to be able to draw a larger supply from the same well than the pump, thus saving in first cost of the well. On the other hand, if the water is found far below the surface, the well must be made much deeper than necessary to reach the water with a pump, or the well must be large enough to permit of more than one lift, so that the depth at which the air-lift can be constructed for economical first cost is limited. Though some of its advocates are ready to claim everything, it is not probable that the air-lift can be used economically to raise water above the surface to a reservoir or tank. Part of the action of the bubbles of air is that of a piston, or of the bucket of a chain pump, which does not completely fill the tube, and therefore permits a large amount of slip. This is not offset by the reduction in density of the column, caused by the mixture of the expanding air with the water. Unless the quantity is very small or the production of other power or attendance is particularly difficult, that portion of the lift above the surface will generally be made by a pump rather than by the air-lift.

The possibilities of the air-lift are not by any means exhausted, and many improvements are in progress. The relative efficiency of the air-lift and a deep well pump, in a recent test, were 18 and 75 per cent. Under unfavorable circumstances the difference might be even more than this, but in the cases to which the air-lift is best adapted the difference will be less, and no small part of this difference will be offset by economies outside that of steam.

In small plants, where quantity is desired at low first cost, and the difference in cost of operation is small in fact, though large in percentage, the air-lift will be largely used. As knowledge of principles and of method of application of details increases, the field in which it can be used will be extended.

One valuable action of the air is to aerate the water so that odors due to minerals in solution disappear, and iron salts, in solution are rendered insoluble and can be removed in a settling tank or reservoir. This method of lifting water might be best, therefore, for such a case as Richmond, Mo. (see page 161, September), if a settling tank is provided.

Ownership of Street Railway Tracks.

In a discussion on municipal ownership of street railways, a division of the subject into three or four parts must be made. The road-bed or permanent way is fixed in position and usually a part of the roadway of a street; the cars and horses or motors are public vehicles differing little from other vehicles so far as the principles of their regulation are concerned; in electric and cable systems there are in addition the overhead wires, conduits, cable and such appliances, taking space in, over or under the street. The structures on private property, such as stables and power houses, are additional appurtenances which may be added to these or put in a class by themselves.

There is a general sentiment that street railways should not be owned by the city. If the vehicles alone are considered, without reference to what they run on, the principle that only public utilities which are natural monopolies should be owned by the city, definitely demands private ownership.

Were it feasible to run private vehicles on the rails, there would be still less question of monopoly in connection with the vehicles. If the rails and road-bed are considered to be a portion of the pavement, as they undoubtedly may be, their construction and ownership pertain to the city, exactly as that of the rest of the pavement does. With this view of the case disappears nearly every trace of natural monopoly. Public convenience demands restriction of ownership of cars to very few owners under careful regulation, but this ownership can be determined by the method of public bidding at definite intervals.

This argument for municipal ownership of the permanent way, and for its lease to private individ-

uals or corporations for operation, is very plausible and offers a solution to the theoretical difficulties. The stables, power-houses, systems of wires and other appliances necessary to run the cars belong theoretically with the cars, and all should belong to the lessee of the road. Practically, the expense of furnishing them is so great and the difficulty of transferring them to a new lessee of the road-bed is so serious that they must nearly all be considered as appurtenances of the road rather than personal property of the lessee, and so must be the property of the city. The question of maintenance and repairs is a troublesome one and the proper distribution of the expense between lessee and city is difficult. Improvement in the system is less likely to occur than when a single owner is interested, unless the contract is very liberal.

This method of dividing the responsibilities obviates most of the theoretical difficulties of entire municipal ownership, and really gives little or no more opportunity for political manipulation by the corporation than private ownership. These advantages are offset to some extent by the probable conservatism in the line of improvements.

Damage from Sewer Overflows.

Several cases have recently been decided in which the city has been held liable for damages to property on account of overflows caused by inadequate sewers. It was for many years very difficult to obtain favorable verdicts for the plaintiffs in such suits, but as the cases of damage became more numerous, and those where the negligence of the city was obvious were developed, the courts were obliged to consider the facts in detail, and have made equitable decisions holding the cities responsible for the results of their negligence and of their failures to provide themselves with competent engineering assistance. Some years ago, before so many cases had come to trial, an Indiana city was compelled to pay large damages for a failure to make the gutters and inlets leading to the sewers large enough to carry the water naturally reaching them in a storm of somewhat more than average rainfall. The tendency in later decisions is to hold the city responsible for the damage if frequent indications of inadequacy of sewers have been observed and the storm is not so far beyond the usual that it may be considered to be out of the reach of reasonable precautions. If, however, the city is unable to do at once all the work of this sort required, on account of lack of funds, it has the privilege of choice, and if an amount deemed reasonable by the court is expended somewhere in the city, damage in some other part of the city must be borne, the court holding that the city is exercising due diligence and that private claims must give way to the public good. It is easy to carry this doctrine to excess, and so work serious injustice to the damaged property holder.

One lesson to be learned by the cities is to secure competent advice in preparing plans for drainage and sewerage systems, that the city may make valid claim of exercising due diligence. The margin for decision for or against the city on this point is small. Many more cities would find themselves assessed for damage for such causes if the possible plaintiffs were not equally ignorant of their rights in the case. Very few attorneys are adequately informed and these are not of the class who travel about seeking damage cases, but the number is slowly increasing. The city which puts its house in order at once is in the best position to set up a successful defense when damage from excessive rainfall actually occurs.

Appeals to expert engineers in such suits are becoming more frequent. In the past the decision as to what is a rainfall to be reasonably expected and taken care of has rested on the average of unscientific observations by untrained observers not particularly interested and with no technical knowledge. The addition of competent engineers to the cases makes them all the worse for the cities, and the proportion of cases where verdicts for damages are secured is increasing.

The Cornwall Bridge Failure.

Little is yet known of the reasons for the collapse of two spans of the new bridge of the New York and Ottawa railroad over the St. Lawrence river at Cornwall, Ontario. The two spans were nearly completed, and a number of men were carried down with them, fifteen being killed and sixteen injured. The bridge is located near the foot of the Long Sault Rapids—where the current is very rapid—eight miles an hour. Witnesses of the accident consider the cause of the accident to be the washing away of the pier, carrying an end of each span.

The plans of the bridge were made under the direction of the chief engineer of the company and approved by its consulting engineer and by the engineer of the Canadian government. The piers were built by Sooysmith & Co., and the superstructure by the Phœnix Bridge Company, both well known for the large and exceptionally difficult contracts they have carried to successful completion.

In the absence of definite information of the present condition of the foundation of the pier, and in view of the known difficulty of determining the exact condition of the bottom at all times during construction, owing to the rapid current, it may be assumed that sufficient allowance was not made for the effect of the rapid current. Reports differ as to whether the foundation was hard pan or solid rock. If it was hard pan or rock which the swift current could disintegrate, the accident may be due to undermining, and this is at present the most plausible explanation.

The depth of the water is nearly forty feet, and the first thirty-five feet or so of the pier was built of

concrete, filled into the crib which was sunk on the prepared foundation. This portion of the pier was completed nearly a year ago, and was apparently in good condition when the upper portion, of stone, was begun last spring. Did the swift current disintegrate the concrete partly in the process of depositing it, making it easier to complete the work later when some accident removed a part of the protecting timber crib? It was subject to several severe shocks from ice and timber rafts during the winter and spring. Perhaps the cement did not set in the pier below the surface. In so rapid a current a slight cause at the beginning would permit rapid development of the defect and account for the sudden failure without any warning.

College of Forestry. New York is the first state to recognize the value of expert knowledge of forestry to the extent of establishing a school where the subject can be properly studied. Such a department has just been opened at Cornell University and the state has turned over its 30,000 acres of forest land as a field for the practical application of the theories worked out in the class-room.

There are two classes of lands upon which forests will be cultivated when this country wakes up to the necessity of replacing the virgin forests now disappearing so rapidly under the axe of the lumberman. One is the waste lands, mountainous or otherwise, such as the Adirondack wilderness in New York, the pine barrens of Michigan and Wisconsin, the mountainous regions of the west. This class of lands was formerly covered with a dense growth of timber. New York is trying to preserve the remnant of the timber not yet taken off and has purchased the vast tracts mentioned, located in the Adirondacks and the Catskills. The denuded portions it will be difficult and in some cases impossible again to cover with timber.

The other class of lands will be the fields which are more or less valuable for purposes of tillage, in the more level states, including the great prairie states. Here there is now a tendency to reserve or to cultivate a "wood lot." on every farm of appreciable size. This lot is frequently on the less valuable, the least workable, part of the farm, and is fairly permanent, even under present conditions. In fact, in the prairie states there is an increase in the wooded area with the increase in settlement. None of the farmers and very few of the large land-owners have any knowledge of the subject of forestry, and fail to make the most of their work. None of them have yet discovered the fact that the wood-lot may be made the most valuable portion of the farm if it is rightly managed and the necessary time is allowed it. Our American hurry to get results is against a scientific cultivation of forests, either on a large scale or on individual farms, and it

will probably be necessary for the stable government to take in hand the work which men of comparatively short lives are not disposed to enter upon.

Other agricultural schools having similar facilities will doubtless follow the lead of Cornell and establish schools for the study of the problems which will arise in their own states. The next twenty years will see a large advance in public opinion and a good start made towards a comprehensive and practical system of forestry in this country.

American Society of Municipal Improvements.

The officers and committee chairmen of the American Society of Municipal Improvements have done much to insure a successful meeting this year at Washington. An interesting programme has been arranged, and the subjects to be discussed by some of the ablest writers of the country insure a profitable occasion for those in attendance. Our national capital has at all times many attractions for strangers, and this year has an added interest by reason of the late war with Spain which has concentrated so much attention upon the official portion of the city's make-up. The programme of the meeting will be found elsewhere. The convention will be held October 26–28.

Clay and Asphalt Production in United States.

The United States Geological Survey has issued a report of the mineral products of the United States by years from 1888 to 1897 inclusive. It shows the following production of the articles named:

Year.	Brick Clay.	Asphaltum.	
	Value.	Short Tons.	Value.
1888	$7,500,000	53,800	$331,500
1889	8,000,000	51,735	171,537
1890	8,500,000	40,845	190,816
1891	9,000,000	45,054	242,264
1892	9,000,000	87,680	445,375
1893	9,000,000	47,779	372,232
1894	9,000,000	60,570	353,400
1895	9,000,000	68,163	348,281
1896	9,000,000	80,503	577,563
1897	8,000,000	75,945	664,632

PERSONAL INFORMATION.

Ericson—Mayor Harrison on July 6, 1897, appointed John Ericson city engineer of Chicago. A few days later Mr. Ericson successfully passed the needful civil service examination, he being the only one of ten competitors who did so. Mr. Ericson brought to the important office he was thus qualified to fill the results of long practical training and experience. Born in Sweden October 21, 1858, he received a common school and collegiate education at his home, later graduating from the Royal Polytechnic Institute, Stockholm. Immediately thereafter, in 1880, he was appointed assistant engineer of the Vasa Bridge, Stockholm, which position he retained for one year, when he removed to America. Arriving here, he was made resident engineer of the Toledo, Cincinnati & St. Louis railroad, and the following year accepted a position as bridge designer with Hopkins & Co. of St. Louis. From 1882 to 1884 he was assistant engineer on the Illinois and Mississippi canal. In the last named year he entered the city of Chicago as draughtsman, which position he filled with such fidelity and ability that he was, in 1886, promoted to become assistant engineer. In 1893 he was again promoted to the position of assistant city engineer, which was followed four years later by his advance to the position of city engineer, the position which he now holds.

JOHN ERICSON

During Mr. Ericson's employment by the city of Chicago he superintended the construction of many important and monumental public works in that city and elsewhere.

He was in local charge of the Lake View, North Shore and Sixty-eighth-st. tunnels. He was also assistant chief engineer for the location and design of the new water works at Seattle, Washington. During his service as assistant city engineer Mr. Ericson was in charge of all tunnel and crib construction and made the plans and specifications for twelve miles of new tunnels, together with two new pumping stations, each station to have four twenty-million gallon triple expansion pumping engines. All this extensive addition to the water works system is now in course of construction, and in addition there have just been completed one thirty-million triple expansion engine at the Fourteenth-st. pumping station, and one fourteen-million compound engine at the Sixty-eighth-st. pumping station. There is also being laid at present 35,000 tons of large water mains to serve as feeders in connection with the new engines. Mr. Ericson has also overhauled all the engines of the various pumping stations, entailing a vast amount of detail work. All the extensive improvements to the water works system of Chicago have called for engineering and executive ability of the highest order, and Mr. Ericson has amply met the expectations of the citizens as well as of the administration.

As an engineer Mr. Ericson stands in the foremost rank. In all the public positions which he has held he has given eminent satisfaction and many of his works stand as monuments to his engineering skill.

He is a member of the Western Society of Engineers, Chicago Academy of Sciences and of the American Society of Swedish Engineers. He has traveled extensively through Sweden, Norway, Germany, Holland, England, Scotland and the United States.

Cappelen—One of the prominent figures at the gatherings of the American Society of Municipal Improvements is F. W. Cappelen, city engineer of Minneapolis, Minn. Mr. Cappelen has been closely identified with the organization since its inception and has contributed much valuable information through papers presented and discussions on many topics of interest. In some respects there is a striking parallel in his history to that of Mr. Ericson, a sketch of whom is given in this department. They are both natives of the great Scandanavian peninsula, Mr. Cappelen's birthplace being Drammen, Nor-

way; both celebrate their birthday on the 21st of the present month, Mr. Cappelen being born in 1857 and Mr. Ericson in 1858. They both removed to America about the same time and both sought and found high

F. W. CAPPELEN.

professional distinction in the great northwest, where so many of their countrymen have won like fame and fortune. Mr. Cappelen entered school at the age of five years and graduated from the Norwegian institute (similar to our high school) nine years later. Three more years were spent in the Technical institute and mining school at Orebro-Sweden, from which he graduated and entered upon a four years' course in the Royal polytechnic institute at Dresden, Germany. From this institution he graduated as a civil engineer with high honors in the year 1880. During the last seven years of this period of preparation and study he was engaged from time to time in government surveys and railway work in Norway and Germany. Coming to America in 1880 he obtained a position as bridge draughtsman with the Northern Pacific railway company in New York City. The following year he was sent by the company to Brainerd, Minn., and later to Montana. Here he remained until the completion of the Northern Pacific railway in 1883, his position being that of assistant engineer of location and construction. He was next transferred to Minneapolis as assistant engineer and bridge engineer with the St. Paul & Northern Pacific company. In 1887 he severed his connection with the Northern Pacific company to become bridge engineer of the city of Minneapolis. In this position not only the bridge work but most of the heavy construction of the rapidly growing and expanding city was in his charge. On Jan. 1, 1893, he was elected city engineer, which position he still retains. The office is one of great responsibility, he having full charge of all departments except parks. Mr. Cappelen is the possessor of talents of a very high order, and these, coupled with a thorough course of study and training and experience, have enabled him to meet all the requirements of his exacting position in a manner that does great credit to himself and the city in whose service he is engaged.

Beach—The chairman of the committee on sewerage and sanitation of the American Society of Municipal Improvements is Capt. Lansing H. Beach, engineer commissioner of the District of Columbia. One of Capt. Beach's most striking characteristics is a

H. BEACH AND MR. BURKE.

liking and capacity for hard work, and in his position he will probably come as near having his tastes in this direction gratified as the most exacting might desire, for the duties of his office are very heavy.

Capt. Beach was born at Dubuque, Ia., in

1860 and graduated from the West Point military academy in 1882, standing third in his class. He has performed engineer duties at Willet's Point, N. Y.; Galveston, Tex., and Cincinnati, O., besides being secretary of the joint commission to determine the boundary between Texas and the Indian territory. From Cincinnati Capt. Beach went to West Point, where he was instructor in civil and military engineering until the fall of 1893. He then went to Galveston for harbor work, and in the fall of 1894 was detailed as an assistant to the engineer commissioner of the District, performing such duties until June 30 last, when he succeeded Col. William M. Black as engineer commissioner.

Mr. Moncure Burke is Capt. Beach's secretary. Mr. Burke is a native of Virginia. He was educated in the public and private schools and took a scientific course at the Corcoran scientific school of Washington, D. C. He was with the Southern Railroad company until 1891, when he became the secretary of Col. Henry M. Robert, the then engineer commissioner, and he has filled that position with every succeeding engineer commissioner.

Van Bergen—On Sept. 9 Mr. C. E. Van Bergen, manager of the Duluth light and water plant, presented his resignation to the board, which accepted it. The resignation took effect Oct. 1. It is understood that the resignation is the outgrowth of the long contest between private and municipal ownership of the water plant, and not of any question as to Mr. Van Bergen's capability as a manager. His previous connection with the owners of the private plant and his outspoken opposition to municipal ownership made a situation which the commissioners and Mr. Van Bergen felt was of so embarrassing a nature that the change was necessary. Mr. Van Bergen had previously tendered his resignation, but the board at that time would not accept it.

CURRENT INFORMATION.

Meeting of the American Society of Municipal Improvements.

At Washington, D., C., Wednesday, Thursday and Friday, Oct. 26, 27 and 28, in the Lanquet hall of the Arlington hotel, will be held the fifth annual convention of the American Society of Municipal Improvements.

D. L. FULTON.
Secretary A. S. M. I.

The convention will be opened by an address of welcome by John B. Wight, president of the Board of District Commissioners of Washington.

This will be followed by a paper by Capt. Lansing H. Beach, corps of engineers, U. S. A., engineer commissioner, District of Columbia, upon the "Utilization of Sewage of Vienna." This paper is a translation of the report upon the subject by the commission appointed by the Austrian government to make a thorough study of the question, and the translation has been made, with comments thereon, by Capt. Beach.

A paper will be given upon "Tree Planting in the Streets of Washington" by William P. Richards, asisstant engineer, engineer department, Washington. Mr. Richards will also contribute a paper upon "A Street Extension Plan for the Entire District of Columbia."

"Proposed Sewage Disposal for Washington, D. C.," will be treated in a paper by D. E. McComb, superintendent of sewers, District of Columbia. The first day's outline also includes the appointment of a committee an officers for the ensuing year and on choice of city for the next meeting.

Thursday morning will be devoted to a visit to the public buildings, including the capitol, new library building and the Smithsonian institute.

Thursday afternoon at 2 o'clock the report of the committee on street paving will be read by Nelson P. Lewis, C. E., of Brooklyn, N. Y., the report having special reference to the construction of surface railroad tracks in public streets, with rail sections, foundations, etc.

The following papers will also be read:

"The Selection of Paving Material," by George W. Tillson, C. E., of Brooklyn, N. Y.; "The Proper Regulating of Curbing and Streets," by Horace Andrews, city engineer, Albany, N. Y.; "The Cost of Repairs to Asphalt Pavements in Buffalo," by E. B. Guthrie, late chief engineer Board of Public Works, Buffalo, at present engineer to the grade crossing commisison. The election of officers, selection of location of next meeting and other committee reports will conclude Thursday's exercises.

On Friday will be given a paper by Harold P. Brown, electrical engineer of New York upon "Electrolysis Tests at Dayton, O.;" and a paper upon "Electrolysis in Davenport, Ia.," by the electrician of that city. The committee on municipal data, Charles C. Brown, C. E., chairman, is preparing a report of special interest, in which will be set out special forms for reports of cities, so that definite information may

J. L. KENNEDY,
Treasurer A. S. M. I.

more readily be obtained from these reports. It is hoped that the special forms of reports may be recommended to the proper authorities as a basis for the statisticial tables on municipal work of the next census.

George H. Benzenberg, C. E., of Milwaukee, Wis., chairman of the committee on review, will submit the report of his committee. The work of the convention will probably be followed by an excursion down the Potomac to Mt. Vernon and other points of interest. Taken as a whole the meeting promises to be one of great profit. The society's officers at present are:

President—Harrison Van Duyne, C. E., Newark, N. J.

First Vice President—L. W. Rundlett, C. E., St. Paul, Minn.

Second Vice-President—E. H. Keating, Esq., Toronto, Ont.

Third Vice-President—A. D. Thompson, C. E., Peoria, Ill.

Secretary—D. L. Fulton, Esq., Allegheny, Pa.

Treasurer—J. L. Kennedy, Esq., Nashville, Tenn.

An Appeal to Detroit Merchants.

Mr. D. W. H. Moreland, president of the Board of Public Works, Detroit, is out with a little circular which evidently undertakes to do by persuasion what the more forcible mandates of the law have failed to accomplish. It will be of interest to officials of other cities who have tried a fall or two with the same problem. It is headed

Detroit The Beautiful,

and asks that the business men of the city desist from an unbeautiful custom. It inquires "Will the business men of the city help the Board of Public Works to keep the city clean?" After stating that many citizens are heartily co-operating with the board in its efforts, it says: "On the other hand, a number of business men continue to have swept and thrown into the streets much of the refuse which accumulates in their places of business. In the early morning a bushel basket full of stuff is swept across the sidewalk into the street from half a hundred stores within the quarter mile circle. This is a violation of the city ordinance and at the same time retards us in our work of keeping the streets in the shape we believe they ought to be." Mr. Moreland's appeal may touch the heart of a chance offender, but we doubt it. A merchant who insists on dumping his accumulated refuse on streets as spotless as those of Detroit usually are, will be apt to turn a deaf ear to anything short of the announcement of a heavy penalty for his misconduct.

New Sanitary Regulations in New York

The special committee appointed by the board of health to investigate the collection and disposal of the garbage of New York City has made a report in which it recommends that the sanitary code be amended so as to compel the removal of garbage from the city every twelve hours to the place of disposal; to prevent any boat or barge used in the removal of garbage from being tied up at any city pier longer than twelve hours at a time; to have these boats covered so as to prevent the escape of bad smells; to provide that garbage must be deodorized. Also that the windows, doors and skylights in the buildings on Barren island be kept closed at all times and that necessary air be forced in by fans and drawn out by pumps, duplicate sets of the

latter being required, so that the breaking of any would not require the opening of the windows. The report was unanimously adopted by the board and the corporation counsel was directed to amend the sanitary code to cover these recommendations. President Murphy was also empowered to revoke the permits of companies on Barren island who do not immediately comply with the new rules. The special committee consisted of Dr. G. W. Martin and Dr. James B. Taylor.

National Road Parliament.

Notice has been issued by Martin Dodge, director of office of road inquiry, U. S. department of agriculture, Washington, that on October 8, at 10 a. m., the National Road Parliament will convene in the auditorium on the grounds of the Transmississippi exposition at Omaha. The objects of the meeting are to awaken and promote a general interest in the improvement of public roads, discuss the best methods of building and maintaining them and to promote good road legislation. The governors of the various states, as well as state and local road improvement associations are requested to send representatives and all other public bodies concerned in the subject as well as all active private friends of the good roads movement are urged to attend.

Should Meter Reading Be Taught in the Schools?

"Should gas and electric meter reading be taught in public schools?" is a question that was discussed at a recent meeting of the Pacific Coast Gas association. The discussion was as follows:

The Secretary—It appears that the question has been discussed in some of the eastern associations, and that one of the foreign journals devoted to the gas industry printed a column editorial on the question of the advisability of teaching meter reading in the public schools. I am a convert to the belief that it should be taught in the public schools. Heretofore, no matter what means he may have employed, the gas man has not been enabled to teach his consumers how to read a meter. I have grown gray in that attempt, and expect all of you have encountered a like unwillingness. They never will understand it; they don't want to; they don't care to. It seems to me that such knowledge should be spread, for the protection of both gas and electric light men, for electric meters are now coming into vogue prominently, and I do not see any reason why everybody should not be taught to read his meter. If the consumers would read their meters the life of the complaint clerk at the counter would be materially happier than now, and there would be better satisfaction in the matter of gas bills besides, because you can convince reasoning men, if you talk to them in your office of the ability of the gas meter to register honestly; but you cannot always prove to them, by the reading of a meter, after the meter has been taken three or four weeks, when they think of making a complaint, that the record then read so and so. In this matter we have adopted a system in our office that I find beneficial, which is a notification by postal card to every consumer of the statement of his meter when originally set; and, if it is changed, of the change of the meter. I find it is very satisfactory. They can keep track of it in that way. However, that is outside of this question. In the higher grades of the grammar school, or in any high school class, this could be made a subject for discussion once a month. Practical lessons could be given to the children, or to the young men and young women, as to the construction of the meter. Every gas company would be very glad to give to each high school in its place a meter for instruction purposes, and with a knowledge of its construction and operation the simple, easy and successful working of the meter would be in time familiarized among the people. That is my response to the question.

Mr. Parker—The introduction of the prepayment meter would seem to solve this problem so far as the gas end of it is concerned. I don't believe there are three people in Napa who can read their meters; in fact, many of them don't know what the price of gas is. Their only thought is, "How much is the bill?" Wherever we introduced the prepayment meter we have not a kicker on the line. At first we put those meters in for troublesome customers. In some cases where, with the ordinary meters, they grumbled at paying $4 a week they now pay with the prepayment meter $8 a week, without a word of complaint. I think the prepayment meter has been quite a boon to gas men, and in its use we find very little trouble. In cases where safe paying consumers find fault with the ordinary meter, we have adopted for their instruction and pacification a system followed by Mr. Clements at Red Bluff. Small blanks showing dials of meters without any index pointers are given to boys to collect statements. They simply take the statements and mark on the diagram the position of the hands. These are brought to the office and the bill is made out. If there is any subsequent trouble about the statement, this diagram is produced generally to the satisfaction of the consumer. I am opposed to the idea of cram-

ming the already over-crammed pupils of the high schools.

Mr. Petch—Notwithstanding the prepayment proposition I believe it will be quite a while before the companies use exclusively the prepayment meter. In my experience the few consumers whom I have been able to persuade to learn to read their own meter have invariably been those with whom I have never had any trouble. It made no difference how large or how small their bills were before we sent our collector, they knew what their bills would be and were ready for us. I fully agree with Mr. Britton that it would be a good thing if all our public school children were taught to read meters. It would not take very long to accomplish this object, and the result would be of incalculable benefit to gas companies in the number of kicks given and complaints made. We tried the Clements' plan, but after a while, however, we discarded it. It would do for a few meters, but when you get quite a large number of these diagrams on your hands it is hard work to keep track of them. One way or another we got losses, no matter what care we took in filling the stub. In fact, we put them on both the bill and the stub (on the bill on one side and on the stub on the other) so they could see for themselves the position of the hand on the bill, and then examine the meter to see if the accounts were correct. At the same time, after quite a while had elapsed, to the time the complaint was made, we often failed to find the particular record desired, and this failure seemed to cause stronger suspicion. On the whole, I believe it would be a good thing to have meter reading taught in the public schools.

Ravages of Electrolysis in Dayton.

An investigation of the water pipes, gas pipes and other underground systems at Dayton, O., develops the fact that fully nine miles of water pipes have been so seriously affected by electrolysis that a calamity is liable to ensue at any moment from a bursting of the damaged pipes. The investigation was conducted by electrical expects Harold P. Brown of New York City, E. E. Brownell of Dayton, J. H. Shaffer, metallurgist of the Pittsburg Testing laboratory, J. O. Hardy, chief chemist of the Pittsburg Testing laboratory, and Charles E. Rowe, secretary of the Dayton water works trustees.

Revision of Water Rates at Milwaukee

A substitute for the Schranck resolution in regard to a reduction of water rates has been adopted at Milwaukee, Wis. The Schranck resolution gave directions to the board of public works to revise and equalize the present rates, so that the same rates should be paid per 100 cubic feet of water for all water consumed, whether by the city, corporations, firms or individuals, and whether with meters or without meters. The council committee on water works ascertained that metered water amounted annually to 320,079,500 cubic feet, and unmetered water to 790,120,900 cubic feet, a total of 1,110,200,400 cubic feet, less leakage. The fixed charges are $64,997.50 per annum; other charges, $155,000, and the amount required for sinking fund $176,250, making the total annual cost of operating $396,247.50. The cost per 100 cubic feet was found to be 3.57 cents, while the present rate varies from 3½ to 15 cents. The substitute adopted directs the board of public works to revise the water rates of the water department so as to equalize the same as far as practicable and maintain the revenue equal to the expenditure of the department, including the amounts necessary to pay annually the interest and the sinking fund of the bonded indebtedness of the department. The revision of rates is to apply to both classes of consumers, metered and unmetered, so far as the same may be just and fair to each class according to the amount of water consumed by each, with the view of producing a reduction of rates to all without materially increasing the amounts paid at present by large consumers. The different city departments are to pay for the water used by them according to the ordinance now in force.

Equitable Assessment of the Cost of Pavements.

The greatest obstacle to a proper system of street pavements in New Haven, Conn., is, in the opinion of Henry T. Blake, president of the park commission, a lack of equitable and uniform assessment of their cost. "The present mode of assessment," Mr. Blake says, "is an incongruous jumble, which it would be hard to match for inequality, injustice and bad policy by any municipal legislation on record. Five different kinds of pavements are in vogue here: Asphalt, brick, stone block and telford and 'hardening,' which latter is really a very good macadam pavement. The cost of asphalt, brick and stone pavements is assessed on the abutting proprietors by one rule, and that of telford by another, while for 'hardening' there is no assessment upon them at all. Naturally any proposition to lay any other pavement than 'hardening' in any street is vigorously resisted by the landowners affected, while the 'pernicious' activity exerted by several localities to get

their streets 'hardened' at the expense of their neighbors has kept the city government in a turmoil for the last year. The remedy for this is to adopt a moderate rate of assessment which shall be uniform for all new pavements, leaving it to the department of public works to determine where and of what kind, any new pavement shall be laid. This is the plan followed in building sewers and it is entirely just and satisfactory."

Mr. Blake suggests as a remedy for the unequal assessments that the legislature set aside the assessments which have been made and that new ones, on a different principle, be ordered; that a general law then be passed by which the whole matter of street paving assessments should be placed on a permanent and reasonable basis and the street paving fund should be made available for all the different kinds of pavements. With these changes the city might look for systematic progress in street paving, each street receiving the consideration which its importance demands, and the kind of pavement which its traffic requires. Mr. Blake has drafted a law, covering the changes referred to by him, which will be submitted to the common council.

Restrained from Issuing Bonds for Public Work.

The supreme court of Wisconsin reversed, Sept. 20, the decision of Judge Sutherland of the superior court, in the suit of Henry Rice against the city of Milwaukee, and restrains that city from issuing $300,000 bridge, street improvement and garbage bonds. The supreme court holds that the constitutional limit was a debt limit and not a bond limit, and that the city had already, at the time it proposed to issue $300,000 of bonds, exceeded the constitutional limit by $51,524.09. Also, the money raised in advance by taxation is a trust fund and ought not to be diverted for other purposes, and that if the money was diverted for other purposes the amount of such diversion constitutes indebtedness within the meaning of the constitution.

The Los Angeles Water Works Litigation.

Judge Oster rendered a decision Sept. 6 in the Los Angeles water works injunction cases, granting the city's request for the appointment of a receiver and enjoining the water company from collecting water rates. While from a technical point of view this is looked upon as a victory for the city, yet the prevailing opinion among counsel seems to be that, inasmuch as the City water company remains in possession of the plant and will control and operate it, the mere fact of a receiver being appointed to receive the moneys is of little importance. In support of the view that Judge Oster's opinion really means a practical triumph for the water company, it is urged that the opinion on file requires the city to pay for all of the present water works system before it can assume its control. In making final disposition of the cases Sept. 10 Judge Oster filed five orders, as follows: (1) Appointing Frank A. Gibson receiver and enjoining the Los Angeles City water company, the Crystal Springs land and water company and the East Side spring water company from collecting rates; (2) enjoining the city from seizing or taking possession of the plant and property of the Los Angeles City water company; (3) a similar order with reference to the Crystal Springs property; (4) granting a stay of execution in authorizing the receiver to collect the water rentals; (5) granting a stay of execution with reference to the company's being required to turn over to the receiver all moneys now in its hands as the result of collections made since the litigation was started. It is not believed that the City water company will appeal at once from the orders of Judge Oster, but that it will attempt to secure a new trial.

Public and Private Water Works.

The records in the office of the labor commissioner show that Kansas has forty-four water plants owned by municipalities, and the same number owned by private corporations, and two or three of the private plants are being converted into public plants. Several new public water works systems are also in course of construction.

Discussions of Engineering Subjects.

The Brooklyn Institute of Arts and Sciences has just issued the first edition of a prospectus, in which it announces engineering lectures for the coming season. Arrangements have been made for eight lectures, illustrated by lantern photographs, at the monthly meetings of the Department of Engineering, held on the first Friday evening of each month.

A special committee, consisting of Samuel McElroy, O. F. Nichols and H. W. Brinckerhoff, has been appointed to organize a testimonial section, comprising engineers and instructors, the object of which will be to discuss subjects of special interest to engineers.

When Municipal Authority Cannot Be Resisted.

An opinion was rendered Sept. 14 by Justice Van Syckel of the supreme court at Trenton, N. J., in which he refused a writ

of mandamus to compel the officers of the old town of Dover to resume the functions of the offices which they surrendered when Dover became incorporated as a city under the act of 1895, since declared unconstitutional. The decision says: "A municipal government which is organized under an act of the legislature which is subsequently adjudged to be unconstitutional is a government de facto and its officers are officers de facto, and its authority must prevail and be respected until the attorney-general interposes by quo warranto and secures the actual ouster and removal of the incumbents in the office.

"No private citizen can challenge the legal existence of an organized municipal government. It can only be successfully assailed by the attorney-general. Until he intervenes the government is de facto and the public functions with which it is charged within the scope of its apparent powers may be lawfully exercised by its officials as de facto officers.

"There is manifest error in the proposition that in resisting the levying of taxes or the enforcement of ordinances the legal organization of the body politic can be attacked on the ground that it is established under an unconstitutional act of the legislature."

Valuation of Water Works.

A report has been submitted to the Indianapolis board of public works on the proposed purchase of the water works plant by John W. Hill, C. E., of Cincinnati. Mr. Hill values the plant at $1,906,682.01, while the proposition offering it to the city places it at over $3,000,000, including interest on deferred payments for twenty-five years. Mr. Hill bases his value upon "the assumption that there has been no deterioration, wear or depreciation in value of any portion of the property. While this is almost true of certain structures, it is not true of buildings, machinery, pipes, valves, hydrants, dams and other details which are constantly being impaired, or which as time progresses, become obsolete and no longer profitable to use." The deficiencies to be deducted are cited as follows:

"1. The value of materials and labor for extension and improvement of the system of rock wells until these shall furnish a supply of water equal to the present maximum consumption.

"2. The cost of reconstructing the reservoir gallery at the riverside pumping station to make this water-tight and prevent infiltration of water into it from the river, and the cost of 5,000,000 gallons of increased storage capacity.

"3. The contract price of the Snow pumping engine, which is not, and has not, since it was erected and started ten months ago, been in condition for continuous daily service at its contract capacity of 20,000,000 gallons of water per diem. (This engine, or its equivalent, is absolutely essential to the demands of the Indianapolis water works at the present time, and the lack of its full capacity, doubtless, has, and will continue to cause, a serious drawback in the operation of the works.)

"4. The cost of reinforcing the pipe system by one or more large feeder mains from the force mains at the riverside pumping station, to such points as a careful survey will show is necessary to overcome the objections to reduced pressures upon the higher elevations, and in such portions of the city where this difficulty is now experienced.

"5. The depreciation of the perishable and renewable portions of the works."

Of a list of seventy-two cities Mr. Hill says that less than seventeen furnish water at rates lower than Indianapolis and ninety-four cities charge higher rates than that city. From a list of eighty-five of the largest cities of the United States only five charge a generally lower rate than Indianapolis; all others have rates as high or higher than Indianapolis. Some conditions of service in Indianapolis favor low cost of operation, and when fully developed may admit of some reduction of the present water rates, but such reduction cannot with safety be made upon the present average daily consumption of water, which is very low for the population of the city and mileage of pipe in the distributing system. Mayor Taggart has ordered a pamphlet, containing copies of the contracts with the water company, correspondence regarding the proposed purchase, etc., printed and hopes for deliberate, but not delayed action.

Tests of Stone for Road-Making.

The experimental work of testing road-building stone, which has been carried on at Harvard university under the supervision of L. W. Page, a geologist, is described in the report of the highway commissioners of Massachusetts. The commission is composed of T. C. Mendenhall, W. E. McClintock and C. W. Ross. In making these inquiries the aim has been to determine the nature of the qualities which constitute fitness or unfitness of the different kinds of rocks for use in road making, the effects of diverse methods of treatment used in the process of construction, and the relative value of the bed rocks and gravels which are found in the several parts of the state. The abrasion and the cementation tests have proved most useful thus far. The machine used in conducting these tests were designed by William Page, under the direction of the commission. The abrasion machine was modeled after the Deval machine, such as is used in making similar tests at the national school of roads and bridges of France. In making the

abrasion tests with the Deval machine the stones employed are of such sizes as will pass through a screen with a 2½-inch mesh and not through a screen with a one-half-inch mesh. In making the test eleven pounds of stone, previously cleaned, are placed in the cylinder; the air-tight cover is then screwed on and the cylinder rotated at the rate of 2,000 revolutions an hour. The rotation of the cylinder throws the fragments of stone from one end of the cylinder to the other twice in each revolution. At the end of five hours, or 10,000 revolutions, the machine is stopped, the cylinder opened and the contents emptied into a basin. The cylinder and cover are carefully washed and the water used is poured into a basin. Each stone is then washed and brushed under the water and is thus cleaned from the adhering dust, which remains in the water as a sediment. After it is dry the detritus is emptied into an automatic sieve which separates that below one-sixteenth of an inch from that above. The per cent. of the one-sixteenth-inch dust may be taken as a coefficient of wear, or the coefficient adopted by the French school of roads and bridges may be adopted by the formula—

$$\text{Coefficient of wear} = \frac{40}{w}$$

where w is the weight in grammes of the detritus, less than one-sixteenth of an inch in diameter obtained per kilogramme of stone.

The tests on all specimens are made under precisely similar conditions, so that all results are comparable. The tests on the more common rocks show the following results:

Kind of Stone.	Highest result. Coeff. of wear.*	Highest result. Per cent. of wear.	Lowest result. Coeff. of wear.*	Lowest result. Per cent. of wear.
Diabase (trap) ...	30.40	1.31	9.28	4.31
Granite	21.16	1.90	8.41	4.76
Felsite	19.81	2.01	12.30	3.26
Gneiss	23.02	1.73	5.01	7.98
Limestone	17.20	2.33	6.31	6.34
Schist	12.52	3.19	4.87	8.20
Quartze	20.34	1.97	9.07	4.41
Field stone (erratics)	19.19	2.08	5.43	7.30

*On the French system.

For testing the cementing value of stone, a machine consisting of a 2.2-lb. hammer arranged like the hammer of a pile driver on two vertical guides, is used. The hammer works automatically and can be dropped any desired hight upon a plunger under which the briquette to be tested is placed. The plunger is held in two guides and attached to it is a lever, pivoted at one-sixth of its length from the plunger and carrying a pencil at its free end. The pencil has a vertical parallel movement five times as great as that of the plunger, and its movement is registered on a drum against which the pencil presses. The drum rotates through a small angle at each stroke of the hammer; thus an automatic diagram is taken of the behavior of the briquette throughout the whole test. The point brought out by this machine is the fact that, when the hammer falls on the plunger, if the material beneath it can withstand the blow, the plunger recovers from the downward thrust given it by the hammer; if not, the plunger stops at the point to which it is driven. In this way the number of blows previous to the critical blow, which destroys the bond of cementation, are accurately recorded on the drum.

The briquettes for the cementation test are made by reducing the stone to a dust that will pass through a sieve of 1-100 of an inch mesh. The powder is put into a slightly tapered steel die of circular section, about 1.33 in. in diameter and .98 in. in hight, mixed with water and subjected to a pressure of 4,400 pounds. The briquette resulting from this is put aside for at least one week, in order to become thoroughly dry.

Street Paving in Chicago.

Under the special assessment law very little paving is being done in Chicago this year. It is estimated that of possibly thirty miles of paving laid since Jan. 1, 1898, 50 per cent. is in new streets, and six miles of this is of cedar blocks on wood base. Only $916,000 was set aside this year for the bureau of streets, while $1,580,000 is required to keep in repair 765.43 miles of cedar block pavement alone. Statistics compiled from the figures of the streets show that of this 765.43 miles of cedar block paving only 20 per cent. is in good condition. The other kinds of pavements and their condition are as follows: Of 357.17 miles of macadam 50 per cent. is in bad condition; Medina stone, 2.29 miles all in good repair; of 25.69 miles of granite block 90 per cent. is in good condition; of 55.26 miles of asphalt, 2.97 miles of block asphalt and 14.80 miles of brick all is in good condition.

Chicago has no general fund which can be drawn upon except from the maintenance of streets already built, but the city is dependent upon special assessments on the property benefited to pay the cost of the original improvements. Under the old law measures providing for street improvements originated in the city council, but under the new law improvements are dependent upon the property-owner, who may petition the board of

local improvements for the form of pavement he may desire. The new law contains a provision which permits the board to declare emergencies in special cases, but when the general sentiment is not in accord with the movement this will rarely be resorted to.

Special assessments levied and confirmed by the courts last year for street paving amounted to $1,124,856.90, which was expended as follows: Wooden blocks, $551,260.39; brick, $119,698.13; macadam, $77,216.59; asphalt, $447,507.55; granite, $28,773.24. These expenditures are exclusive of alley paving, for which assessments amounting to $19,000 were levied. Chief Engineer Wheelock is of the opinion that the fact that an increase over other years is shown in the amount of asphalt used is a good indication. He also maintains that while there is a lack of activity in building new streets, yet there is a tendency to abandon the cheaper pavement for the more durable kinds. The commissioner of public works, L. E. McGann, does not have such a hopeful view of the future for street paving, but, on the other hand, can see no relief in sight from the operation of the special assessment law, and is helpless to better affairs under present conditions.

A Contractor Paid in Advance.

The village of Highland Park, adjoining Detroit's northerly limits, has made repeated applications for permission to connect with the public sewer in Woodward-ave., the main thoroughfare running through the heart of the city. In the event of being successful the village would commence operations and bring the sewer down two miles to the big main. The board of public works refused a permit unless the city was compensated for the privilege and the amount was fixed at different times in sums ranging from $20,000 to $30,000. About the middle of August the vilage sold bonds for sewer construction, and after being promptly purchased and the cash paid, a contract was made with James Hanley to build 10,000 feet for $51,000 and the price was paid in advance, an almost unheard procedure in public work. The contractor agreed to take the responsibility of making the connection with Detroit's main sewer. The price is fully $1.50 per foot more than contracts now under way in Detroit this season. The board of public works positively refused to grant a permit. Mr. Hanley's workmen were within fifty yards of the city limits, and the intention was to secure a connection while the board was napping. But President Moreland, always wide awake, started the corporation counsel on the contractor's trail. A special meeting of the common council was called and steps taken to prevent trouble. The matter was taken into the courts and an injunction was issued at once, restraining Mr. Hanley from connecting with the Woodward-ave. sewer. Speaking of the peculiar move of the Highland Park people, Mr. Moreland said: "The action of the village in going ahead with the work without consulting the city authorities is something which paralyzes the old sewer contractors and has called forth criticisms which are anything but favorable. The village should be able to explain why it is paying so much more per foot for sewer work than is being paid in Detroit. But the contractor agreed to make the connection with the Woodward-ave. sewer. If he fails all the money used to bring the work down to the limits will be lost. One of the functions of the board is to give or withhold permits to enter all kinds of sewers within the limits. The matter will have to pass through our hands and possibly the common council as well. I want to say emphatically that my vote will not be cast in favor of connecting with the Woodward-ave. sewer, unless compensation is made to the city for the privilege. My colleagues on the board share my opinion in the controversy."

Brick Paving in Detroit.

Although the paving season is drawing to a close work has not been brisker in Detroit at any time since early spring. A score of streets are under way to be paved with cedar block on concrete foundation, two jobs of asphalt and a number of brick streets and alleys are in progress. The last issue of Municipal Engineering gave the details of the suit brought to restrain the city from entering into a contract for the paving of Atwater-st. The case was apepaled to the supreme court and no decision has yet been handed down. In the meantime the Board of Public Works mapped out a plan whereby the eight streets for which money had been raised by taxation for repaving with brick would be completed. Specifications were prepared and a communication sent to the common council, dealing only with ten streets in question, which was promptly acquiesced in and the work is now being rapidly pushed along. The communication, which will be read with interest, is given in full:

"The position heretofore taken by the Board of Public Works in regard to brick laid in our streets, namely, that none but that of the best quality should be used, and that the Board of Public Works, as the responsible administrative body, should be and is, under the law, the judge of such quality, is hereby reaffirmed. But as the paving season is rapidly passing by, and the

work of paving our streets, for which the people have taxed themselves, is being delayed, and not desiring to be charged with or be a party to obstructing the progress of public improvements, the board hereby notifies your honorable body that it will entertain bids and enter into contracts with the lowest responsible bidders for the paving with such kind of brick as may be designated by your honorable body. In doing this, the board desires it to be understood that while it will do the best in its power to protect the interests of the city as it sees them, the responsibility for results in the selection of paving brick, as above mentioned, against its protest, must rest with your honorable body. Very respectfully.

"D. W. H. MORELAND,
"President of the Board of Works."

Exhibit of Clay Industries at State Fair.

The Executive Committee of the Illinois Clayworkers' Association has made arrangements with the Illinois State Fair Association for an exhibit of the clay industries of the state, to be held each year at the state fair grounds, Springfield, Ill. The fair this year was held Sept. 26 to Oct. 1.

Street Repairs in District of Columbia.

The report of C. B. Hunt, the computing engineer of the District of Columbia, to Captain Beach, the Engineer Commissioner, shows that during the fiscal year ending June 30, 1898, $29,955.38 was spent in repairs to streets, avenues and alleys, and $149,999.32 on repairs to concrete pavements; that 14,-266.28 sq. yds. of street pavements were laid and that the city now has 262.65 miles of pavements, including the pavements laid in suburban sub-divisions by property-owners. These pavements have never been formally accepted, but, having cost the District nothing, it is expected that they will be kept in repair at public expense. The policy pursued during the last year of excluding macadam and gravel roadway pavements from streets added to the schedule of work submitted in the yearly books of estimates is believed to be sound and should be perpetuated. The proper materials for this class of work are such as are best suited to the street and its traffic, and it is certain that a sheet or block pavement offers every advantage. A street improved with macadam or gravel is found in a short time again pressing for a place on the list of streets to be paved. Once paved with proper regard to its requirements it is eliminated from future similar consideration. Emphasis is laid on the fact that a sheet roadway must have a certain amount of travel to prevent rapid deterioration, and the lack of this is evidenced in several of these little used streets in the development of suburban properties. An innovation in the vitrified block pavements has been the introduction, at intervals of about 60 ft. in the length of the alley pavement, of expansion joints filled with asphaltic cement in order that temperature changes may be taken up at those points. Asphalt block pavements do not require this construction as their nature is sufficiently elastic.

St. Paul's Delinquent Water Bill.

The water commissioners at St. Paul, Minn., has given notice that there is due the water board from the city about $450,000 for water furnished for fire purposes since December, 1891. The water board furnishes the city water for fire purposes and charges a rate of about $60,000 per year. Bills have been sent the comptroller regularly every six months since December, 1891, but no attention has been paid to them.

City Not Bound by Contract Unless Made in Writing by Order of Council.

The judgment of the lower court, in the case of the J. M. Griffith company against the city of Los Angeles, has been affirmed by the supreme court. The facts of the case are as follows: The city and certain contractors executed, April 24, 1893, several instruments whereby the contractors agreed to construct, at their own cost for labor and material, sections 3 and 6 of an out-fall sewer leading from the city to the ocean, for which construction the city agreed to pay the aggregate sum of $77,450. The sections were constructed and the contractors received most of the compensation provided in the contract. They assigned to the plaintiffs these claims against the city for some unpaid balances, and for the value of certain alleged extra material used by them in the work. In the trial court the plaintiffs got judgment for some hundreds of dollars, but not for all of its demand. From the contract price the sum of $5,000 was withheld for application to cost of repairs during the first six months. The city began repairing during the sixth month and continued from August to February. The main issue was for cost of certain steel bands used for securing the pipes laid. The supreme court says in connection with this: "The city charter provides that the city of Los Angeles shall not be bound by any contract, or in any way be liable thereon, unless the same is made in writing, by order of the council, etc.

"The course pursued by the engineer and the contractors, however just may have been their intentions in fact, ignored any right of the city to determine either the ex-

tent or the price of changes in the work then under contract. If it could be effectual to charge the city against its will for the additional bands (for securing certain pipes), then it is not perceived that the contract afforded any protection whatever to the city against the indefinite expansion, both of the plan and cost of the sewer at the pleasure of the engineer and contractors. In our opinion the terms of the contract do not support plaintiff's claim for the value of said bands."

Diversion of Percolating Water by One Corporation from the Lands of Another Corporation.

The supreme court of New York rendered a decision recently relating to the ownership of underground water. The suit was brought against the city of Brooklyn by the Merrick Water company, which collected the water it sold from what it was claimed was an underground stream supplied by a watershed. This stream, it was claimed, came to the surface on the company's land and flowed into ponds which it owned. The city of Brooklyn acquired a strip of land north of the company's pumping station, sunk wells and erected pumping stations on it, from which water was delivered to the city. The referee, by whom the case was first heard, found that the effect of the defendant's pumping had been to lower the permanent level in the company's well from seven to eight feet. In reviewing the referee's judgment the court held that the evidence failed to prove the existenc of a subterranean stream of water supplying the well in question, and that the interruption was, therefore, one of percolating water. The legal question was the diversion of percolating water by one corporation from the lands of another corporation, both engaged in collecting the water, not for use on the land itself, but for transportation and sale to third persons, who had no interest or right of use of the water as connected with the land. The court held that in this respect their rights were equal, and the same rule was applicable as would apply in case either owner desired to improve its land for use. Then neither party would be liable for the diversion of percolating water, because he was engaged in the exercise of a legal right, and the rights of each were equal in the use and employment of the land. When both seek to use the land for exactly the same purpose, and neither seeks to improve it for the purpose of beneficial enjoyment, but to make a profit from the business carried on, the right to such use must also be equal. Under such circumstances if one gets more than the other there can be no more ground for complaint than would exist if both sought to improve their own land and one secured more than the other, or one was damaged and the other not.

Testing Sewer Pipes of Cement and Clay.

The preliminary report of Mr. Max Gary, who was appointed by the International Association for the Testing of Materials to take charge of the investigation of methods of testing sewer pipes of cement and clay, has been published in "Les Materiaux de Construction," Nos. 23 and 24. The committee, at the head of which Mr. Gary was placed, was appointed in 1896. In 1895 he investigated, for the German Association of Manufacturers of Portland Cement, the methods employed by governments, municipalities and individuals in testing the strength of cement pipes. He found that these tests varied in each case and none were regarded as complete for the purpose intended, and that similar conditions existed in other countries than Germany. Mr. Gary concluded that the points to be determined in the tests to be made were as follows: The resistance to internal and external pressure; impermeability; resistance to the attack of acids; the wear and tear upon the interior by sand passing with the water. The tests should then mainly determine the bursting and crushing strength, and the texture and composition of the paste used. In a cement or clay pipe the most important property is the resistance to exterior pressure, for, with few exceptions, such pipes are simply covered with earth or sand, and not placed in masonry. It is necessary in passing judgment upon the fitness of these pipes to distinguish between the loads to which they are to be subjected, as pressure upon them will differ, some being laid under traveled streets, under railway embankments, or under the foundation walls of buildings. The practice of a number of German cities in the test of cement is detailed by Mr. Gary as follows:

The Department of Public Works of Liegnitz requires that a cement pipe one meter (3.28 ft.) diameter should resist the pressure of a layer of earth three meters (9.48 ft.) thick; at Rosenheim, pipes covered with 12 to 16 ins. of earth should resist the pressure of a heavy vehicle; and at Colmar, when there is any doubt of the solidity of a pipe, a loaded wagon is passed over the laid pipe. At Schwerin, in Mecklenburg, cement pipes must resist, without cracking, a pressure equal to 50 kilograms per linear meter and per centimeter of diameter. This test is made by placing railway rails on the top of the uncovered pipe. The city of Freysing

prescribes that the pipe should support a "load of 6,000 kilos, concentrated upon the top of the pipe;" and Passau demands that the pipe resist a pressure of 805 lbs. per lin. ft. At Zeitz, where the pipes are buried 6 to 8 ft. beneath the surface, a steam road roller is passed over them before acceptance. Clay pipes, one meter diameter, have been tested at Mannheim, by burying them in the earth, with a covering layer about 18 ins. thick. Over the pipe was then placed a double plank platform, about 3 ins. thick in all, and 3.28 ft. square, and on this was placed the test load. The rupturing load was found to be about 28,600 lbs.

For the test of pipes of "armed-cement," or cement reinforced by a double iron mesh on the Zisseler system, the engineer of bridges, at Breme, prescribes the following test: The pipe is buried in sand in a solid wooden box; then by means of a cover fitting inside the box a pressure of 7,500 kilos. per running meter, or about 500 lbs. per lin. ft., is applied to the pipe. The pipe is required to stand this pressure without deformation or cracking. For pipes of oval section, 120x96 cm., and sides 6.5 cm. thick, armed with three layers of metallic mesh, a uniform load of 9,000 kilos. per meter, or a little over 600 lbs. per foot, is prescribed. At the Hague the resistance of beton pipes is determined by placing them in a trench and then loading them uniformly on the square meter of horizontal projection. One pipe in each 50 is submitted to this test; and this load is carried up to 12,000 kilos. for pipes 1.5x1 m. and 1.2x0.8 m. At Copenhagen Mr. Emanuel Jensen employs a process for testing pipes of clay and of "armed cement" which has given very satisfactory results. A heavy timber is imbedded in the soil, carrying upon one end a heavy counterweight of cement, and near this are two bars of iron, pierced with holes, attached to the sides of the timber. The pipe to be tested is placed in a strong wooden box, nearly filled with sand, and resting upon the timber, and pressure is applied to it by a lever and saddle with the lever support on a pin passing through the holes in the iron bars. The advantage of this process is that the commencement of cracking in the pipe can be noted; though this is of little advantage in the test of clay pipes, as after the appearance of the first crack the pipe will support but little more. But in the case of the Monier and Zisseler construction, where the iron skeleton augments the cohesion of the material, the appearance of the first fissure precedes by some time the final crushing load.

At the test laboratory at Malines, the resistance of pipes to exterior pressure is tested by a Kirkaldy machine, the pipe being placed between two wooden saddles which each embrace one-third of the circumference of the pipe. But as it is difficult to insure contact with all the inequalities of the pipe the process is not satisfactory.

The Duty of a City in the Construction of a Sewer.

Judge Bartlett, Appellate Division of the New York State Supreme Court, has rendered a decision in a suit brought by Thomas F. Martin of Brooklyn to recover the value of his property for damages caused by inadequate sewers. A violent thunder storm and heavy rainfall on Aug. 31, 1895, overcharged the sewers along one street, and the surplus water flooded one of the lots and entered a building where a number of barrels of lime were stored. The lime was slaked, setting fire to the building and burning a quantity of woodwork. In his decision Judge Bartlett stated that a municipality cannot lawfully maintain a sewerage system, which, because of its inadequacy to carry off the combined sewage and rainfall reasonable to expect, creates a nuisance on the property of adjacent landowners. Ample evidence was given before the trial court to show that the sewer had often been so overburdened as to force up the manhole covers and allow water to escape over the street and occasionally over the adjoining lots. While this happened only in heavy storms, yet it occurred with enough frequency to show that the sewers in that part of the city were incapable of carrying off the quantity of sewerage and rainwater which it is reasonable to expect to flow into them under conditions of weather by no means unusual. The fact that during previous storms when property in the vicinity had been flooded this particular building had not been affected, made the case somewhat complicated. The owners of the property had, however, raised the grade of sidewalk along the premises a short time before August, 1895, in order to protect against further floods, so that the overflow on Aug. 31 found its way to the storehouse in which the lime and woodwork were kept for the first time. Judge Bartlett decided in favor of the plaintiff. He said that "assuming the inadequacy of the sewer, any property-owner whose premises are likely to be flooded had the right to protect himself, if he could, by the erection of a barrier, and the liability of the city for injury done by the overflow was not affected by the fact that such a barrier changed the direction of the moving water, and threw it upon land which would

not otherwise have suffered. It was the duty of the city, if it undertook the construction of a sewer there at all, to construct it in such a way that even in heavy rains none of the neighboring private property should be flooded by reason of its lack of capacity."

Need of Permanent Street Monuments.

In a report by Adin Mann, city surveyor at Elgin, Ill., he says that the street monuments of that place are in a wretched condition. The original line stakes disappeared years ago, and, as few of the first monuments remain, the original starting points of bounds cannot be found. This condition, together with the large surpluses in most of the older parts of the city, have caused an almost inextricable confusion. The property-owners cannot re-establish the lines and consequently there are many encroachments of several feet on the streets. Mr. Mann says "the only remedy is a thorough, careful survey by the city of each plat as a whole and in connection with all the surrounding plats, and the planting of permanent monumets of stone or iron at every corner, with a map made of such survey, approved by the city council and made a matter of record."

Things Found in a Sewer.

Among the things removed from a sewer in Baltimore, Md., recently by F. R. Bye, street cleaning commissioner, was a spring bed, a roll of roofing tin five feet long, three wash boilers, four brooms, a coil of telephone wire and a wheel of a bicycle.

A System of Water Works in a Private House.

A citizen of Orion, Ill., has solved the problem of having a system of water works in a private house where the town has no water works. He placed on the second floor of his house a galvanized iron tank which will hold fifteen barrels of water. The water is taken off the roof to the tank and there is an overflow pipe running to the cistern; the tank is carried some four or five feet from the floor, which gives sufficient pressure to force it to any place desired in the house; pipes run from the tank to a boiler in the kitchen, where it is heated by the cook stove. In this way both hot and cold water can be supplied, the hot water coming from the kitchen and the cold water from the tank. Arrangements are made to keep the tank supplied in the winter, when there are no rains, by pumping from the cistern.

Meeting of the American Society of Civil Engineers.

The American Society of Civil Engineers met Sept. 21, the subject of road-building being under discussion. A letter from P. McLeutze of the New York state road department was read in reference to the model roads, for which an appropriation of $50,000 had been made. The only road built so far on this plan is between Schenectady and Troy, but a number of applications have been filed by different counties. Mr. James Owen spoke of the material change in the good roads question within the last five or six years, and said his own theory and practice had been greatly modified to correspond with the new conditions and developments; that competition between roads and pavements, which has been effected by decreasing the prices of ordinary permanent pavements has been the leading factor in the change; when a telford pavement cost 82 cents a square yard and an asphalt pavement costs $1.38 it is evident that the permanent structure becomes available in many places that could formerly consider only road-building. He did not believe in thin roads, and considered a thickness of five inches of telford and three inches of macadam better than eight inches of macadam alone; but ten inches of telford is usually cheaper and gives better results than eight inches of macadam. Trap rock is the sine qua non for telford and macadam. Formerly he required all stone to be of a size that would pass through a 1½ or a 1¼-inch ring, but strict observance of this rule has made trouble, and he had modified his views in regard to size and abandoned the cast-iron rule. The size of the stone should be according to the locality, and he now classifies it according to the character of the travel. One and one-half inches is good for country travel, but not for a heavily traveled road, where it should be increased to two or three inches, which gives better results, more uniform service and greater economy. The size of the stone must not be mixed or varied, or any dust used. Engineers must insist on uniformity; sand, gravel, loam, clay or almost any other available material will answer for binding the stone, but ordinary earth is the best, and all should be used sparingly for binding and filling. Clay is treacherous and has been known to spoil a road. Packing and binding material must be used with judgment and with special reference to the weather, present and prospective. It can be used more freely in dry than in wet weather. Limestone needs very little binding and shale none at all. A trolley railway track in the middle of a telford

pavement gives entirely different conditions of maintenance from those that obtain with an ordinary homogenous road, and greatly increases the cost and difficulty of maintenance. He now uses three inches of macadam stone and gives each side of the railway an individual crown and covers it with gravel. His experience was that trolley tracks double the cost of maintaining macadam roads.

W. E. McClintock said that in the work of the Massachusetts state road commission the most difficult roads have been built first, so that the cost would diminish instead of increase as the work progressed. So far all roads 15 feet wide with 3 feet shoulder on each side have cost $10,300 a mile. Strict attention is paid to drainage on clay or non-porus soil, telford roads being built with a foundation carefully rolled and covered with three inches of gravel. On this 6 inches of rock is laid on the largest face, with the longest dimensions transversely; the interstices are filled with wedged stone tightly driven; the points are broken off to the 6-inch level and the surface filled with small stone and well rolled. Broken stone of telford foundation is made to give a finished thickness of 5 inches in the center and 4 inches on the sides after heavy steam rolling. Without a telford foundation the thickness on good soil is 6 inches at the center and 5 inches at the sides. When the soil is doubtful the broken stone has been re-enforced by 2 inches of gravel laid on a rolled sub-grade. Road stone is selected for hardness and toughness; trap rock is generally the best, but sometimes does not give the best results. Country roads are worn more by the weather than the traffic, and for them trap rock does not wear enough to replace the dust that blows away. In these cases a top dressing of screenings is used, except in some cases where a small sprinkling of sand has been substituted. Another method is to cover the top of the stone with blue gravel before the screenings are applied; the order of materials is reversed, placing the 1¼ inch stone at the bottom and the 2½ inch on top, always keeping the different sizes scrupuously separated.

Mr. Budd, state road commissioner of New Jersey, said that in the southern part of that state most of the roads are 8-inch macadam, from 10 to 12 feet wide in the country and 16 feet wide in the towns. They are built at an average price of from 50 to 60 cents a square yard, varying between 23 and 80 cents. In Passaic county most of the roads are 4 inches thick and none of them more than 6 inches. Good gravel roads have been built cheaply on solid sand, where the gravel had to be hauled only a short distance, at a total cost of from $1,000 to $1,500 a mile.

N. P. Lewis, engineer of street construction and maintenance, Brooklyn, N. Y., said the construction of good roads should be kept constantly in view and actually begun long before the contract is let, by preliminary adjustment of grades and alignment, which may be made at any time, and the roads finished years later. Drainage is the first essential in road building, and, if not in porous soil, sub-ditching and underdraining may wisely be effected long in advance of the completion of the work. He considered that some variation in the size of macadam stone is admissable; stone passing through cylindrical sieves of 2 inch mesh and refused by those of ¾ inch mesh gives about the same results as that of uniform size that is rolled until the top is broken enough to fill the void. Screenings and flour and quarry sweepings are much used for top dressing, and he had specified for it 60 per cent. of screenings and flour mixed with 40 per cent. of sand and gravel.

Calvin Tompkins said sufficient attention is not given to consolidating the road into a monolithic mass of stone. Macadam's idea of making the road simply a wearing surface was right.

G. A. Roullier suggested that the thickness of the roadbed is the only flexible factor in its construction. If the roadbed is strong enough the conditions of service are independent, and nothing is gained by adding extra thickness. Thin roadbeds must have coarse, hard binding materials. Sand and coarse screenings will generally give the best results. Many failures have been caused by the use of soft fillers; raveling is prevented by the addition of 30 per cent. of limestone dust to the filling.

E. W. Harrison, chief engineer of the Hudson county public roads of New Jersey, said Hudson county boulevard is a city street from 12 to 14 inches deep and is composed of 8 inch trap rock telford, 4 inches of 2 to 2½ inch macadam, with 1½ inch stone on top and finished to a hight of 1½ inches above grade, with a layer of screenings and flour rolled about 110 times with a 15-ton roller, and an abundance of water on the lower eight miles of the road. On the upper portion of the road, where the water was costly, a very little clay was laid between the layers of stone, so as to hold the water for a few minutes. The telford was rolled hard, the projecting points broken off, the interstices well wedged and thoroughly

rolled, no chips being allowed; the 2½ inch and the 1¼ inch course of macadam stone were rolled separately. Repairs have been made by rolling in 1½ inches of small stone where required on the surface.

J. J. McLaughlin, county engineer, Queens county, New York, said the heaviest roads in that county are 8 inches thick in the center and six inches on the side. In Jamaica three-fourth of a mile of street was built of 4 inch macadam spread loosely, and sustained a traffic of from 80 to 100 wagons per day for three months without trouble, injury or wear. The road that is originally poorly built may be redeemed by good maintenance.

Technical Meetings.

The first annual meeting of the American Section of the International Association for Testing Materials was held at the Engineers' Club, Philadelphia, Aug. 27. The by-laws adopted are suplemental to the general laws of the International Association and are intended solely for government of what formed one section of the association. Each member shall pay $2.50 annual dues, of which $1.50 shall be transferred to the international association and the remainder used to defray the expenses of the American section. The officers of the American section will be a chairman, vice-chairman, secretary and treasurer, constituting the executive committee, and two members of the international advisory board. The American member of council of the international association shall be ex-officio a member of the executive committee. The officers of the American section shall be elected at annual meetings and shall serve for two years. The problems, which are to be investigated by the international committees, and the American members who will act upon these committees are as follows:

1. "Testing as a basis the existing conditions of inspection, to establish uniform international rules for the testing and inspection of all kinds of iron and steel." Two members to be appointed.

2. "Determinations of methods of test of the homogeneity of iron and steel with the object of eventually employing these methods for inspection." Booth, Garrett & Blair, Gus. C. Henning, Prof. Thomas Gray, Paul Kreuzpointner, A. A. Stevenson, William R. Webster.

"Preparation of uniform methods for the test of paints used for protection against corrosion of railroad structures." H. B. Seaman, J. A. L. Waddell, and two members still to be appointed.

3. "Unification of methods of test of tile pipe." One member to be appointed.

"Supplemental to the solution of the question of standard consistency of standard mortars. Determination of conditions which will produce approximately similar densities in tension and in compression briquettes." Richard L. Humphrey.

4. "Investigation of the behavior of soft steel under abnormally low temperatures." Prof. George W. Bissell.

5. "Methods of tests of welds and weldability." One member to be appointed.

7. "Collections of masses of material for the preparation of standard piece tests, with special reference to axles, tires, springs (car), cast and wrought iron pipes, as well as the separate parts of structures." One member to be appointed.

10. "Investigations of the most practical methods of polishing and etching for microscopic study of wrought iron." Albert Sauveur.

11 and 12.—"Study of the relation of chemical composition to weathering qualities of building stones. Study of the effect of the gases of combustion, especially sulphurous acid." One member to be appointed.

"Study of the relation of chemical composition to weathering qualities of roofing slates." Prof. Mansfield Merriman.

14. "Determination of rapid methods for determining conditions of constancy of volume of hydraulic bond materials." Richard L. Humphrey, William M. Maclay.

15. "In what manner can hydraulic bond materials be tested for tensile strength in the shortest period of time?" William W. Maclay, Dr. Charles F. McKenna.

16. "Testing and evaluating the resolutions of the conferences relating to the determination of adhesion of hydraulic bond materials." Booth, Garrett & Blair and one member still to be appointed.

17. "Examination of propositions for the uniform determination of the value of puzzolanas as mortars." Two members to be appointed.

19. "Investigation of the effect of fecal matter on the strength of hydraulic bond materials." Two members to be appointed.

18. "Investigations of the causes of abnormal behavior of cements as to the time of setting." Two members to be appointed.

22. "How can the inspection of lumber assure protection against the growth of fungi (merulius lacrymans)?" Prof. John B. Johnson.

23. "Determinations of fundamental methods for testing lubricants (oils)." One member to be appointed.

"American committee to report to the

American section on the present state of knowledge of impact tests." Prof. W. K. Hatt, chairman; Prof. Edgar Marburg, James Howard.

The reports will probably be published either abroad or in a special proceedings on this side, although a consideration of this point just at present is deemed premature.

The German Gas Light association will hold its annual meeting at Niagara Falls, N. Y., Oct. 19. 20 and 21, 1898. Some of the papers to be presented are as follows: "The Effect of the Depth of Fire Upon the Practical Efficiency of a Water Gas Generator," J. M. Rusby, Jersey City, N. J.; "Notes on Mains and Main Laying," Walton Fustall, Philadelphia, Pa.; "The Loss of Illuminating Power of 25 to 30 Candle Gas When Mixed with Air," Dr. E. G. Love, New York City; "A Comparison Betwen the Cost of Pumping Gas By Steam and Gas Engines," H. L. Rice, Norfolk, Va.

The convention of the Central States Water Works association was held in Springfield, O., Sept. 27, 28 and 29.

The seventeenth annual convention of the American Street Railway association was held in Boston Sept. 6-9. Officers were elected for the ensuing year as follows: President, Chas. S. Sargeant, second vice-president of Boston Elevated Railway company, Boston; first vice-president, Henry C. Moore, president Trenton Street Railway company, Trenton, N. J.; second vice-president, Ernest Woodruff, president Atlanta Consolidated Street Railway company, Atlanta, Ga.; third vice-president, Walton H. Holmes, general manager Kansas City Railway company, Kansas City, Mo.; secretary and treasurer, Thos. E. Pennington, treasurer Chicago City Railway company, Chicago, Ill. The next convention will be held in Chicago.

The seventeenth annual convention of the New England Water Works association was held at Portsmouth, N. H., Sept. 14, 15 and 16. The papers presented were as follows: "The Method for Determination of Color, and the Relations of the Color to the Character of the Water," Frederick S. Hollis, Boston, Mass.; "Some Things That Should Be Done in Constructing a Distributing System of Water Works," Wm. R. Hill, Syracuse, N. Y.; "The Occurrence of Cristatella in the Storage Reservoir at Henderson, N. C.," Rober S. Weston, C. E., Brockton, Mass.; "The Description of the Moncon, Mass., Water Works." Frank L. Fuller, C. E., Boston, Mass.; "Man's Imitation of Nature in Purification of Water," Dr. Gardner T. Swarts, Providence, R. I.; "Result of Tube Well Experiments in Lowell, Mass.," George Bowers, city engineer of Lowell; "Surface Water Supplies," John C. Haskell, Lynn, Mass.; "Description of the Separate High Pressure Fire Service System of Providence, R. I.," C. V. French, Boston, Mass. The convention voted to change the constitution so as to allow meetings to be held outside of the New England states, and Syracuse, N. Y., is being considered for the next convention. Officers were elected as follows: President, F. F. Forbes, Brookline, Mass.; vice-presidents, M. A. Sinclair, Bangor, Me.; C. K. Walker, Manchester, N. H.; F. H. Crandall, Burlington, Vt.; R. J. Thomas, Lowell, Mass.; Byron 1. Cook, Woonsocket, R. I.; R. S. Bartlett, Norwich, Conn.; secretary, J. C. Whitney, Worcester, Mass.; treasurer, G. E. Batchelder, Worcester, Mass.; executive committee, J. C. Haskell, Lynn, Mass.; G. A. Stacey, Marlboro, Mass.; Patrick Kiernan, Fall River, Mass.; finance committee, Wm. F. Codd, Nantucket, Mass.; A. W. F. Brown, Fitchburg, Mass.; Horace Kingman, Brockton, Mass.; senior editor, Joseph E. Beals, Middleboro, Mass.; junior editor, W. H. Richards, New Lindon, Conn.

Personal Notes.

C. M. White has succeeded Mayor Anderson at Clinton, Ind.

Joseph Wilson was installed as mayor Sept. 5 at Washington, Ind.

William Waplington died at his home in Philadelphia Aug. 10.

J. A. Pinkston has been elected city engineer at Orange, Tex.

Philip A. Jackson, city engineer, Dorchester, Mass., died recently.

Martin L. Saulsbury, C. E., Ridgley, Md., died Aug. 22, aged twenty-six years.

Capt. J. H. Gunning, road builder and contractor, Vicksburg, Miss., died Sept. 5.

Dr. W. W. Zimmerman has succeeded Hon. J. S. Ostrander as mayor at Richmond, Ind.

H. R. Hobart has resigned his position on the editorial staff of the Railway Age at Chicago.

Andrew M. Willoughby has been elected mayor, to succeed Hon. Cicero F. Northern, at Greensburg, Ind.

Frank J. Illig has been appointed superintendent of the water bureau, to succeed Col. Francis G. Ward at Buffalo, N. Y.

J. L. Sterritt has been appointed superintendent of streets, to succeed Edgar F. Wheeler, at Sing Sing, N. Y.

Charles Spinks, a prominent contractor of Newport, Ky., was drowned in the Ohio river recently. His body was found Sept. 13.

F. W. Lincoln, who served seven terms as mayor of Boston, Mass., died recently at his home in Dorchester, aged eighty-one years.

Frank W. Brown of the firm of Brown Bros., bridge and railway contractors, Elizabeth, N. J., died Aug. 27, aged eighty years.

Hamilton B. Gaylord, who was at one time supervisor of highways in Philadelphia, Pa., died in that city Sept. 11, aged eighty-two.

A. R. Dow has been appointed superintendent of the Salem Water company, at Salem, O., to succeed F. W. Allison, deceased.

Asa Williams of Owensboro, Ky., has been apopinted chief engineer of the water works at Paducah, Ky., to succeed D. C. Holly, resigned.

E. C. Oliver, C. E., Alpena, Mich., has been appointed chief engineer of the water works gineering in the University of Illinois, Champaign, Ill.

Prof. Edward Orton, state geologist of Ohio, has been elected president of the American Association for the Advancement of Science.

Charles A. Hague, M. Am. Soc. C. E., New York City, was selected by the city council of Camden, N. J., to test the water works of that city.

G. M. Briggs, civil engineer and surveyor, has established an office in the Farmers' and Manufacturers' bank building, Poughkeepsie, N. Y.

H. E. Wells of Columbus, Ind., has been elected superintendent of the light and water plant at Rushville, Ind., to succeed A. T. Mahin, resigned.

M. F. Offet, who has had general supervision of the Barber Asphalt company's business in Saginaw, Mich., has been promoted to assistant general manager.

W. M. Leftwich, jr., has been appointed city engineer, to succeed W. W. Southgate, and Felix Smith has been appointed assistant city engineer at Nasnville, Tenn.

Daniel H. Johnson, for several years superintendent of the water works and member of the water board at Salem, Mass., died at Stamford, Conn., Sept. 7, aged sixty-eight.

J. S. T. Stranahan, ex-president of the park commission, Brooklyn, N. Y., and ex-president of the board of trustees of the Brooklyn bridge, died of apoplexy Sept. 3, at Saratoga, N. Y.

David E. McComb, M. Am. Soc. C. E., superintendent of sewers, Washington, D. C., was ordered recently to visit Boston, Chicago, Milwaukee and Montreal, Quebec, to examine works in connection with the preparation of plans for the pumping station for the sewage disposal system of Washington.

L. M. King, superintendent of the public works department of the Merchants' Association, San Francisco, Cal., and President Dohrmann of the association, visited the East early in September for the purpose of inspecting and collecting information relative to public works, such as paving, sewerage, street lighting, drainage, street railway service and cleaning and sprinkling streets.

Dr. John Hopkinson, the English electrical engineer, with his son and two daughters, was killed recently while ascending, without guides, a mountain in the canton of Valais, Switzerland. Dr. Hopkinson had received the degrees of M. A. and D. Sc., was a Fellow of the Royal Society, a member of the Institute of Electrical Engineers and a member of the Institute of Civil Engineers. He received, at different times, the Telford medal and Telford premium of the Institute of Civil Engineers for valuable contributions to science. To electrical engineers he is, perhaps, best known as the author of the "Hopkinson Method" of dynamo testing. He had intended starting for New York Sept. 28 on business in connection with a syndicate which he was forming for the purpose of developing some of his recent inventions.

MACHINERY AND TRADE.

Recent Inventions.

(Reported specially for MUNICIPAL ENGINEERING, by Arthur M. Hood, Indianapolis, Ind. Copies of any patent may be obtained for 10 cents.)

609,449—Aug. 23, 1898—Excavating Machine—G. J. Miller, Duluth, Minn. Assignor of one-half to J. A. Watterworth & M. Fee, same place. The device is provided with a vertically swinging boom. Mounted so as to slide along the boom is a scraping bucket which may be forcibly drawn outward along the boom by cables suitably connected with a windlass. Means is also provided for swinging the boom in the usual manner.

609,679—Aug. 23, 1898—Grader and Scraper—Calvin Karraker, Dongola, Ill. A longitudinally movable carriage carrying at each side a vertically swinging endless belt scraper.

610,180—Sept. 6, 1898—Apparatus for Melting Snow. J. B. Greening, Philadelphia, Pa. A portable oil-burning furnace into which snow may be shoveled.

610,550—Sept. 13, 1898—Road Grading Machine—J. V. Maxey, Mt. Vernon, Ill.

610,575—Sept. 13, 1898—Drawbridge—E. C. Ackers, Port Huron, Mich. Swinging gates are mounted in the approaches and connections made between these gates and the swinging draw by means of which the swinging of the draw will automatically open and close the gates.

Trade Notes.

The establishment of an asphalt plant, for use in repair work, is contemplated at Louisville, Ky.

The Phoenix Bridge company, Phoenixville, Pa., has been licensed to incorporate in Illinois.

The Barber Asphalt Paving company contemplates the erection of an asphalt paving plant at Leavenworth, Kas.

The Humboldt Brick Manufacturing company, Humboldt, Kas., has begun operations and is manufacturing vitrified paving brick.

The Trenton Fire Clay company, Trenton, N. J., has been incorporated to manufacture and sell vitrified and refractory clay products.

The City Refuse Utilization company, Jersey City, N. J., has been incorporated to remove and utilize refuse by Herbert Tate, William W. Gooch and Henry W. Meen.

Japan produces annually about 600,000 barrels of Portland cement, worth there about $2 (gold) per barrel. About 10,000 barrels of natural cement is also produced.

The Ginzel Paving company has been organized at Wyandotte, Mich., for the purpose of laying cement walks by Capt. Ginzel, George B. Palmer and Mayor William Gartner.

Under the names of Last Chance, Nos. 1 to 10, inclusive, ten asphaltum claims have been located in Tie Fork of Spanish Fork canyon, Spanish Fork, Utah, by John Christensen, Wilborg Christensen, Albert Singleton and William Bird, sr.

Deposits of marl, valuable in manufacture of cement, have been discovered in Lake Maxinkuckee, six miles west of Argos, Ind. State Geologist Blatchley has had soundings made and the deposits thoroughly investigated and will make an analysis of the deposits.

The Higginsville Quarry company of Missouri, a recently organized corporation, composed mainly of St. Louis capitalists, has leased twenty acres of land of the Confederate Home association, at Higginsville, Mo., and will develop the asphalt, which has been found at a depth of thirty feet. Under the terms of the lease the company must pay to the home 52½ cents a ton for every ton taken out.

The International Correspondence schools of Scranton, Pa., have issued a "Brief Synopsis of Our Course in Telephony," which gives some idea of the great extent to which their methods of education by means of correspondence alone have been carried. From the outline of the course of study in telephone work it would seem that anyone who desired to fit himself to enter this important branch of electrical practice need only resolve to employ his spare time between other duties and he could, with resolution, equip himself quite as thoroughly as he could by a course of study in a technical school at a vast greater expense in both time and money. The course leads up from a study of the laws of acoustics through the historical stage of the telephone down to the present day practice in manufacture of the instrument, line construction, exchange or central office apparatus and all the many details which enter into the subject.

IMPROVEMENT AND CONTRACTING NEWS.

PAVING.

Macon, Mo.—A good roads association has been organized in this county.

Evansville, Ind.—The asphalt paving on Edgar-st., is about completed. It is the first asphalt street constructed in this city.

Utica, N. Y.—(Special.)—Joseph Kemper, assistant city surveyor, says that the Columbia Construction company has about completed Court-st. Besides Court-st. the company has contracts for three other streets, which will aggregate 12,780 sq. yds., making a total, including Court-st., of 36,000 sq. yds.

Dallas, Tex.—By a unanimous vote of the aldermen they voted to expend the sum to be derived from the 10 per cent. levy in improving the streets generally and especially those in the suburbs. Mayor Taylor advocated the plan of paving certain streets out of this fund and then expending the balance, about $13,000, for repaving one of the business streets.

Kansas City, Mo.—A large number of contracts for sidewalks, pavements, sewers, etc., are being held up, owing to a scarcity of brick, and as a result of this scarcity City Engineer Wise has requested the board of public works not to order any brick work for this year. City Engineer Wise has completed a table showing the amount of paving done so far during the fiscal year, as follows: Asphalt, Barber Asphalt company 171,652 sq. yds., $353,273; Gilsonite company, 80,000 sq. yds., $168,000; vitrified brick, 101,430 sq. yds., $150,592; brick alleys, 9,187 sq. yds., $14,167; total, 362,170 sq. yds., $686,032.

CONTEMPLATED WORK.

Houston, Tex.—Paving is urged for Main-st.

Moorehead, Minn.—The council has voted to repave Ridge-ave.

Gloucester City, N. J.—Paving is proposed for Broadway. Cy. Clk.

Elizabeth, N. J.—The question of asphalt paving is being agitated.

Ashtabula, O.—Spring-st. will be paved with brick or asphalt blocks.

Montreal, Que.—The improvement of St. Catherine and Craig-sts. is contemplated.

Hamilton, O.—Macadam paving is contemplated for N. Third-st. O. M. Burns, cy. clk.

Providence, R. I.—Street work has been ordered by council that will cost about $58,000.

Oswego, N. Y.—Asphalt paving is contemplated for the intersection at E. First and Bridge-sts.

York, Pa.—Estimates have been submitted for constructing 133,915 sq. yds. of paving.

Elgin, Ill.—Brick paving is proposed for Milwaukee-st., from the railroad track to Spring-st.

Annapolis, Md.—Paving has been ordered for Randall-st., from Prince George to Market Square.

Mauch Chunk, Pa.—The question of issuing $40,000 bonds for street improvements will be voted on.

Plainfield, N. J.—Asphalt paving is contemplated for Park-ave. this year by the city council.

Newburg, N. Y.—The question of asphalt paving is being considered. Chas. Caldwell, cy. engr.

Sacramento, Cal.—Riverside-ave. will be improved with macadam at a cost of about $2,500. Supt. McLaughlin.

Cleveland, O.—A resolution has been passed to advertise for proposals for paving thirty-two streets.

San Antonio, Tex.—Paving is contemplated for W. Commerce-st., from Military Plaza to Paschal Square. Mayor Callaghan.

Lincoln, Neb.—Ordinances were approved, Sept. 17, creating repaving districts Nos. 3 and 4. J. W. Bowen, cy. clk.

Schenectady, N. Y.—The aldermen will consider the question of paving Clinton and Union-sts. at their October meeting.

Waterloo, Ia.—The council has voted to pave with brick F-ave., First, Second, Bryant and N. Main-sts. and Wilbur-ave.

Toronto, Ont.—Asphalt paving is being considered for Major-st. by the board of public works; estimated cost, $27,290.

Scranton, Pa.—An ordinance will be introduced in the council for an appropriation of $68,000 for repairing paved streets.

Montgomery, Ala.—Brick paving has been ordered for Washington-st. at an estimated cost of $13,040. C. P. Hardaway, cy. clk.

Sioux City, Ia.—At the request of the contractor the contract for paving down town alleys has been canceled and new bids will be taken.

Springfield, Mass.—The improvement of a number of streets and the construction of sidewalks is recommended by the board of public works.

Newark, N. J.—Notice of intention has been adopted to pave Warren-st., from Norfolk to Bruce, with oblong granite blocks.

Athens, Ga.—An election to authorize the issue of $50,000 paving bonds is favored by the citizens.—W. W. Turner, clk. and trus.

Albany, N. Y.—A petition for brick paving for Rose-st., from Hamilton-st. to Madison-ave., has been favorably reported to the council.

Chicago, Ill.—The extension of Washington boulevard to Maywood, a distance of four miles, is proposed by the West Park commissioners; estimated cost, $600,000.

Richmond, Va.—Vitrified brick or other permanent paving material is being considered by the council as a substitute for the cobble stone paving on Sycamore-st.

Boston, Mass.—The board of aldermen has concurred with the common council in the loan order of $201,500, $132,000 of which is for street improvements.

Brooklyn, N. Y.—A resolution has been presented to the board of public improvements recommending asphalt paving for the streets surrounding the Norwegian hospital.

Norwalk, Conn.—The question of constructing about 7,000 sq. yds. of brick paving on concrete foundation is being considered, according to press reports. Chas. N. Wood, cy. engr.

St. Paul, Minn.—The board of public works is considering the preliminary order for paving Wacouta-st. The city engineer's estimates are: Granite, $5.70 per front ft.; asphalt, $6.

Anderson, Ind.—Petitions for asphalt paving on W. Twelfth-st. and asphalt or creosoted paving on W. Ninth-st., have been referred to the board of public improvements.

Patchogue, L. I.—The village trustees have passed a resolution that the properties adjoining the streets now paved be laid with sidewalks of stone, vitrified brick or granitoid.

Cicero, Ind.—Plans and specifications have been accepted by the town board for the improvement of East-st., and a sidewalk on the west side, between Jackson and Buckeye-sts. Surveyor Mitchell.

Washington, D. C.—Orders have been issued by the district commissioners to repair a large number of streets, by the burner method, cost chargeable to appropriation for repairs to streets, 1899.

Sharpsburg, Pa.—(Special.)—E. C. Hulbert, boro. engr., says $60,000 bonds will be issued for the purpose of repairing all cobble streets with wooden pavement. About 45,000 sq. yds. of this work will be done at once.

New Albany, Ind.—The committee on streets and alleys of the town of Silver Grove will give a hearing on Oct. 3 on the proposed improvement of Elkin-ave., from Silver-st. to the old State Run road, resolutions for which have been adopted.

Helena, Mont.—The city council decided Sept. 19 to construct stone cross-walks and ordered the board of public works to advertise for bids for them, and for the construction of granolithic pavement and stone gutter in front of the city hall.

Chicago, Ill.—The local board of improvements decided Sept. 21 upon paving a number of streets with asphalt, granite and cedar. A resolution has also been passed to pave with macadam, curb and gutter N. Forty-first-st., from Irving Park boulevard to Montrose-ave.

Pawtucket, R. I.—A joint resolution has been introduced in the common council appropriating $9,000 for paving Cottage-st. with asphalt. A resolution was passed in concurrence, appropriating $1,700 for the improvement of Prince-st., from Sabin to Greene. Prest. Jenks, of coun.

CONTRACTS TO BE LET.

New Brunswick, N. J.—Bids are asked until Oct. 3 for brick paving. John L. Jacques, cy. clk.

Stewart, Minn.—Bids will be received until Oct. 8 for grading a road. H. J. Heath, clk. Grafton twp.

Norwalk, O.—Bids are asked until Oct. 4 for constructing brick paving in Norwood-ave. F. W. Christian, cy. clk.

Troy, N. Y.—Bids are asked until Oct. 4 for grading and widening Mill-st. E. Ogden Ross, secy. contracting bd.

Oshkosh, Wis.—Bids will be received until Oct. 4 for curbing Thirteenth-st., from S. Main to Oregon. B. P. W.

Council Bluffs, Ia.—Bids are asked until Oct. 10 for asphalt and brick paving in certain streets. Cy. coun.

Deerfield, N. Y.—Bids are asked until Oct. 4 for improving the River road for 2¼ miles. C. W. Adams, state engr., Albany.

Cincinnati, O.—Bids are asked until Oct. 5 for granite paving and granite curbing in Delhi-ave. G. H. Spellmire, clk. B. C. A.

St. Louis, Mo.—Bids will be received until Oct. 7 for constructing granitoid sidewalks around St. Louis place. Pres't McMath, B. P. I.

Hoboken, N. J.—Bids are asked until Oct. 12 for asphalt paving in nine street, and for improving certain streets. M. V. McDermott, cy. clk.

Winnipeg, Man.—Bids will be received until Oct. 19 for paving Portage-ave., from Main to Hargrave-st., with asphalt. Acting Mayor Wilson.

Terre Haute, Ind.—Sealed proposals will be received until Oct. 18, for paving with brick and curbing two alleys. Wm. K. Hamilton, cy. clk.

Carthage, Ill.—Bids will be asked, according to press reports, about Oct. 15 for 25,575 sq. yds. of brick paving. M. P. Barry, prest. bd. local imp.

Indianapolis, Ind.—Sealed proposals will be received until Oct. 3 for constructing cement sidewalks and improving certain streets. M. A. Downing.

St. Paul, Minn.—Bids will be received until Oct. 10 for macadamizing Rice-st., St. Paul, Bald Eagle and White Bear Lake roads. D. M. Sullivan, co. audt.

Madisonville, O.—Sealed proposals will be received until Oct. 6 for macadamizing, curbing and flagging Peabody-ave., from Central-ave. to Park-ave. Bennett Carter, vil. clk.

Wausau, Wis.—Sealed proposals will be received until Oct. 10 for macadamizing Franklin-st., from Main-st. to the C., M. & St. Paul railroad crossing. Chas. F. Beck, cy. clk.

Georgetown, O.—(Special.)—C. M. Gordon, county engineer, says the Shinkle, Ridge & Cedron road failed to sell on Sept. 3, as advertised, and it is re-advertised to be sold Oct. 11.

Atlantic City, N. J.—Sealed bids will be received until Oct. 3 for 42,086 sq. yds. of macadam, and 11,165 sq. yds. of vitrified brick paving on concrete foundation. Edward S. Lee, chrm. St. Pav. Com.

Terre Haute, Ind.—Sealed proposals will be received until Oct. 4 for improving Center-st., from Oak to Deming, and constructing concrete sidewalks on Tenth-st., from Sixth-ave. to Spruce-st. Wm. K. Hamilton, cy. clk.

Boonville, Ind.—Sealed proposals will be received until Oct. 20 for paving Third-st., from Locust to the L. E. & St. L. tracks, with standard macadam and curbing with Oolitic limestone. Chas. H. Johnson, town clk.

Cleveland, O.—Bids will be received until Oct. 5 for paving Ridge road, in Brooklyn twp. Julius C. Dorn, clk. bd. co. comrs. Sealed proposals will be received until Oct. 7 for repaving Pearl and Lorain-sts. with asphalt. Geo. R. Warden, Dir. Pub. Wks.

Toledo, O.—Bids will be received until Oct. 3 for paving Ontario-st., from Stickney-ave to Ash-st., with vitrified blocks on concrete, and until Oct. 10 for paving Sixth-st., from Main-st. to Kelsey-ave., with vitrified blocks on concrete. Lem P. Harris, cy. clk.

CONTRACTS AWARDED.

Malta, O.—The contract for brick paving has been awarded to W. J. Berry of Marietta for $8,630.

Beardstown, Ill.—The contract for laying a portion of Main-st. has been awarded to M. Murphy.

Westminster, Mass.—C. H. Kelliher, Newburyport, secured the contract for building a state road for $3,963.

Salem, O.—Davis & Caldwell, Youngstown, O., submitted the lowest bid for paving Lundy-st. with brick, for $4,392.26.

Shamokin, Pa.—The contract for paving Shamokin-st. with Mack brick was awarded to D. O. Heim at $1.62 a sq. yd.

Charleston, W. Va.—Royal J. Larter secured the contract Sept. 15 for 2,000 ft. of curbing at 46 cts. a ft.

Pittsfield, Mass.—The contract for constructing a section of state roads was awarded to Harris & Letteny, Boston, for $6,787.

Moberly, Mo.—The contract for brick paving was awarded to John Hinley & Co. of Des Moines, Ia., at $1.14½ a sq. yd.

Owosso, Mich.—The Warren-Scharf Asphalt Paving company secured the contract for asphalt paving in this city for about $35,000.

Marshalltown, Ia.—The contract for constructing cement walks was awarded to J. C. Dunn at 8 9-10 cts. a sq. ft.

West Hoboken, N. J.—The Barber Asphalt Paving company was awarded the contract for paving Clinton-ave. for $59,552.

Grand Forks, N. D.—The lowest bidder for 4 mls. of cedar block paving was P. McDonnell of Duluth, Minn., at $1.06 a sq. yd.

Frankfort, Ky.—A contract for brick paving is said to have been awarded to the Gaffney Brick company of Winchester, Ky., for $15,000.

Ligonier, Ind.—The contract for brick paving was awarded to John W. I. Moran at 84 cts. for Massillon brick and 27 cts. a ft. for curb.

Albany, N. Y.—The contract for paving Elm-st., between Grand-st. and Delaware-ave., has been awarded to Mulderry Bros. for $32,079.

Rochester, N. Y.—The contract for paving N. Clinton-st. with asphalt was awarded to Whitmore, Rauber & Vicinus at $1.70 a sq. yd.; total, $78,000.

Webster, Mass.—The contract for paving Pleasant-st. with block was awarded Sept. 18 to Fred T. Ley & Co. of Springfield at $2.37 a sq. yd.

Bridgeport, Conn.—The B. D. Pierce, Jr., company was awarded the contract Sept. 16 to macadamize E. Main-st. at $1.56 a lin. ft.

Fremont, O.—The contract for paving W. Croghan-st. will be awarded to George Kinney, the lowest bidder. Trimble brick will be used.

Fargo, N. D.—The contract for constructing 71,000 sq. yds. of cedar block paving has been awarded to James Kennedy of this city at $1.06 a sq. yd.

Milwaukee, Wis.—John J. Crilley was awarded the contract for paving the upper end of Wisconsin-st. with Nelsonville brick on concrete at $1.59 a sq. yd.

Buffalo, N. Y.—The contract for surfacing Niagara-st., from Niagara Square to Porter-ave., has been adwarded to the Barber Asphalt Paving company for $33,097.

Cincinnati, O.—The David Folz Asphalt Paving company, city, secured the contract for paving, grading, etc., at the California pumping station for $109,382.

Marshall, Mo.—The contract for constructing 23,000 sq. yds. of macadam paving has been awarded to W. H. Kohlmeyer & Co. of Jefferson City, Mo., for $23,894.

Meadville, Pa.—Peter Schenck of Butler, Pa., was awarded the contract Sept. 14 for 1,480 sq. yds. of brick paving at $1.25 for Park wire-cut brick.

Denver, Col.—The Denver Paving company secured the contract for paving Champa-st., from Nineteenth-st. to Downing-ave., with Alcatraz asphalt, for $71,221.77.

Chester, Pa.—The contract for paving Market-st. with asphalt was awarded Sept. 5 to the Vulcanite Paving company at $1.80 a sq. yd. for a ten-year guarantee.

Pana, Ill.—John F. Bretz & Son, Springfield, Ill., have been awarded a second contract in this city for 10,000 sq. yds. of brick paving at $1.38¼ a sq. yd.

Glens Falls, N. Y.—The lowest bid submitted Sept. 5 for constructing 5,800 sq. yds. of brick paving in Glen-st. was that of W. R. Johnson, Catskill, N. Y., at $1.80 a sq. yd.

Terre Haute, Ind.—William C. Miller secured the contract for constructing new concrete walks in N. Sixth-st. at 8 cts. a sq. ft., 31 cts. for curbing and $1.85 for granite corners.

North Braddock, Pa.—The contract for grading, paving and sewering Belle-ave. has been awarded to Ott Bros. of Pittsburg and J. H. McCready of Braddock for $20,000.

Buffalo, N. Y.—The contract for constructing 32,000 sq. ft. of marbleithic sidewalk around Humboldt park has been awarded to the Buffalo Marbleithic Paving company for about $6,000.

Des Moines, Ia.—The contract for paving Eleventh-st., from Forest-ave. to College-ave., with brick on broken tile concrete, was awarded Sept. 8 to J. W. Campbell at $1.39 1-10 a sq. yd.

Charleston, Ill.—H. C. Maltby, Lincoln, Ill., secured the contract for paving Nineteenth-st. at $1.33 a sq. yd. for Evansville brick, and 44 cts. a lin. ft. for stone curbing.

Toledo, O.—F. E. Cole was the lowest bidder for block paving in Knower-st., at prices ranging from $1.33 to $1.50, and in Rockingham-st. at $1.35 to $1.55, and for asphalt $1.52.

Keokuk, Ia.—Paving contracts were awarded Sept. 7 as follows: Brick paving, 5,761 sq. yds., Cameron & McManus, city, $1.35, or $9,392.79; macadam, MaManus & Tucker, city, 59 cts., or $6,030.82.

Tuckahoe, N. Y.—Bellew & Merritt Co. secured the contract for constructing telford macadam paving on Midland-ave. at $1.24, and Cronin Hill at $1.19 a sq. yd., and 50 cts. a lin. ft. for brick gutter.

Binghamton, N. Y.—(Special.)—H. Ward says the contract for paving Collier-st. was awarded to Eugene Fee of Olean, N. Y., at $1.97½ a sq. yd. Brick made by the New York Brick and Paving company will be used.

Logansport, Ind—Lux & Talbott, city, submitted the lowest bid for paving Third-st. with Clinton block, for $7,125.90, and for paving Sycamore-st. with Terre Haute brick for $14,802.09. Asphalt filling will be used.

Joliet, Ill.—J. C. Regan submitted the lowest bid Sept. 5 for paving Washington-st. with brick, as follows: Galesburg brick, $1.19; Streator, $1.17; curbing, 38 cts.; excavation, 30 cts.; resetting old curb, 10 cts.

Terre Haute, Ind.—Contracts for constructing roads have been awarded as follows: Paris road, Jean, Jean & Haxton, Worthington, Ind., $5,000; National road, $3,263, and Darwin road, $6,739, Fred S. Jessup, Worthington.

Lincoln Neb.—The Barber Asphalt Paving company has been awarded the contract to repave Eleventh-st. with asphalt at $2 a sq. yd. The contract for paving O-st. was held up by an injunction suit brought by O. N. Humphrey.

Chester, Pa.—George Wiegand has been awarded contracts for relaying the asphalt blocks on Seventh-st., which have been torn up to relay tracks and switches, and to relay the blocks on Seventh-st. after the tracks have been put down.

Coshocton, O.—Bids have been received for paving Main-st. as follows: N. G. Abbott, Columbus, O., $27,758; Adams Bros., Zanesville, O., $24,648; J. N. Kissner, Warsaw, O., $20,647; C. B. McArthur, Kenton, $25,019; Townsend & Co., Zanesville, $20,764.

Cincinnati, O.—The contract for the repair of Fairfield, Auburn and Gholson-aves., Fifth-st. and Garfield-place, was awarded to the Warren-Scharf Asphalt Paving company, and McMillan and Findlay-sts. to the David Folz Asphalt Paving company. The contracts are for a period of five years.

Columbus, O.—Bids were received Sept. 22 for improving Yale-ave., from State to Broad-st. The bid of N. B. Abbott was the lowest submitted, and it was only about $10 lower than that of Wm. H. Luchtenberg, while that of S. A. Sullivan was but a little higher.

Monroe, Ala.—Bids were received Sept. 8 for brick paving on concrete in Desiard-st., from the Coaldale Brick and Tile company, Coaldale, Ala., Coffeyville Vitrified Brick company, Coffeyville, Kas., Talbott Paving company, Shreveport, and Tennessee Paving company, Memphis. The awarding of the contract was deferred.

Allegheny, Pa.—The lowest bid received Sept. 6 for paving Pennsylvania-ave. with asphalt was $2.25 a sq. yd., which was 40 cents higher than the lowest bid received two months before for asphalt paving. The committee on public works rejected the bids and ordered the director of public works to readvertise.

Youngstown, O.—Bids were received Sept. 13 for paving Scott-st. as follows: Barber Asphalt company—Excavation, 12 cts.; curb, 40 cts.; cement curb and gutter, 59 cts.; paving complete, $1.84. Assyrian Asphalt company—Excavation, 25 cts.; curb, 38 cts.; cement curb and gutter, 50 cts.; paving complete, $1.74.

Omaha, Neb.—Paving contracts have been awaraded to the Grant Paving company as follows: Sept. 3—Poppleton-ave., from Park-ave. to Thirty-second-st., $1.26 a sq. yd. Sept. 10—Twenty-fourth-ave., from Harney-st. to St. Mary's-ave., asphalt, $1.43. Sept. 17—Thirty-second-ave., from Hanscom park to Dorcas-ave., asphalt, $1.45.

Syracuse, N. Y.—Bids were received Sept. 19 for paving the roadway in front of Porter school, from Emerson-ave. to Bridge-st., with asphalt or asphaltina, as follows: Empire Contracting company, Alcatraz asphalt, $1,700.10; Columbia Construction company, Trinidad asphalt, $1,676.70; Asphaltina Construction company, asphaltina, $1,683.20.

Baltimore, Md.—The municipal board of awards rejected all proposals submitted for repairs to streets as being too high. The bids ranged, for repairs to streets, from $3.98 to $4.18 a sq. yd., while new asphalt pavements are laid at a cost of from $1.52 to $1.59 a sq. yd. The work will be done by day labor and the material purchased by the commissioner's department.

Portland, Ore.—The Trinidad Asphalt Paving company was awarded contracts, Sept. 3, for paving Fifth-st. with Trinidad asphalt, $1.64 a sq. yd., or $2,543.57; and Alder-st. at $1.64 or $15,341.71. Smyth & Howard were awarded contracts for new sidewalks, crosswalks and box and stone gutters on Hawthorne-ave., for $2,754.41, and Nickum & Kelly, one block and a half and intersection for $572.70.

Indianapolis, Ind.—The contract for paving Tenth-st., from College-ave. to Bellefontaine-st. with asphalt was awarded to the Western Paving and Supply company at $4.27 a ft. on each side. Contracts for cement sidewalks were awarded at the follow-

ing prices: J. C. Veney, 75 and 37 cts.; Daniel Foley, $1.30; S. F. Herron, $1.15; Capitol Paving and Construction company, $1.18; C. M. Kirkpatrick, $1.17.

Chicago, Ill.—The contracts for paving N. Clark-st., between Division-st. and North-ave., and N. State-st., between Kinzie and Division-sts., with asphalt, were awarded, Sept. 20, to the Barber Asphalt company at $2.15 a sq. yd. Contracts for boulevarding Oakley-ave. were awarded, Sept. 16, as follows: Sackley & Peterson, 23,100 sq. yds. asphalt, $1.91 a sq. yd.; catch basins, catch basins rebuilt and repairing manholes, $45,-396. John Sargent, 16,270 sq. ft. concrete sidewalk, $2,115 and 12,620 ft. curbing $6,089.

Detroit, Mich.—The contract for paving Second and Montcalm-sts. was awarded, according to press reports, to the Alcatraz Constructing company at $1.81 a sq. yd., which is the lowest asphalt bid ever submitted in this city. Other contracts awarded are as follows: Atwater and Rivard-sts., brick, Sheehan & Co.; Cass and First-sts., Currie & Co., at prices averaging $1.58 a sq. yd. The mayor, however, vetoed the contract for paving Atwater-st. Contractor Stevens secured a contract, Sept. 20, for laying 74,000 Waynesburg brick, and Holmes, Strachan & Co. 54,000 Hallwood block.

Quincy, Ill.—Bids for paving Second-st., from Broadway to Vine, were received, Sept. 15, as follows: Peter Simons—Paving, 89 cts. a sq. yd.; excavating, 23 cts. a cu. yd.; rock excavation, $1.50 a cu. yd.; curbing, sewer pipe, catch basins and seven iron crossings, $2,057.50. Henry Rees—Paving, 86½ cts.; excavating, 18 cts.; curbing, sewer pipe, catch basins and seven iron crossings, $2,019. Contracts were awarded, Sept. 17, for paving alleys with brick as follows: Donation alley, $1.11¾; Mulberry alley, $1.09½, and Peach alley, $1.15, Peter Simons; Jail alley, $1.08½, and Jessamine alley, $1.11, Henry Rees.

New Orleans, La.—The council rejected Sept. 6 the bids for asphalt paving in Canal-st. The specifications called for bids for paving the entire street, including the neutral ground, on which four or five street railway tracks run the entire distance. While the bids were under consideration an attempt was made by the city authorities to make some arrangement with the railways by which the paving of the neutral ground could be carried on simultaneously with the rearrangement of their tracks. This fell through, and the railways threatened to carry the matter to court. The council then decided to reject the bids. The contracts for paving Claiborne and Camp-sts. were awarded as given in the September number of Municipal Engineering.

Kansas City, Mo.—The board of park commissioners awarded the contract Sept. 7 for laying cement sidewalks on Benton boulevard to the Kansas City Stone Sidewalk company at 22 cts. and the contract for curbing and guttering to Buntin, Shryer & McGannon at $1. Contracts were awarded Sept. 12 as follows: Monroe-st., asphalt, Gilsonite Roofing and Paving company, $2.10, or $8,350; Amarette-st., brick, Trestrail Paving company, $1.19, or $785; alley, brick, R. J. Boyd Paving and Construction company, $1.59½. Curbing contracts—C. M. Cravens Sidewalk company, 44¾ cts.; Emil Bohrer, 50 cts.; Sutherland Sidewalk company, 54½ cts. Sidewalks—Trestrail Paving company, 17½ and 15 cts.; M. Schoonmaker, 15.49 cts; J. J. Armstrong, 15½ cts; Portland Paving company, 15¾ cts.; Missouri Sidewalk company, 15 and 15½ cts.; Bandera Flagstone company, 18 cts.

SEWERS.

Cohoes, N. Y.—The prize for the best sewer plan of those submitted was awarded to the one signed I X L, in accordance with the recommendations of the expert of the commission, Palmer C. Ricketts of Troy, N. Y.

Louisville, Ky.—Damage suits have been filed against the city by twenty-one property-owners, who claim that their property has been damaged as a result of overflows, due to a defective sewerage system. The total amount sued for is $26,650.

Stratford, Ont.—An investigation has begun into the complaints by the board of health of the township of Downie against this city for alleged pollution of the River Avon by draining the city sewage into the river. Much evidence has been given to the effect that while years ago the water was pure and clear, it is now filthy and slimy.

San Rafael, Cal.—Considerable trouble has arisen over the proposed construction of the gravity sewerage system, owing to the fact that after plans and specifications for a stone gravity system were submitted, and $26,000 voted and sold at a premium of $1,916, the town trustees are about to change the plans and substitute wooden mains for ironstone pipe, as provided in the original plans.

New Orleans, La.—The newly appointed sewerage commission held its first session Sept. 20 and framed a set of propositions to be submitted to the franchise holders. The councilmen hope to base some satisfactory solution of the question upon the answer. City Chemist Metz urges the immediate necessity of the system and says its introduction will decrease the death rate. The commission consists of Chairman Story and members Dreyfus, Ricks, Claiborne, Tesso and Moran.

CONTRACTS TO BE LET.

Oshkosh, Wis.—Bids will be received until Oct. 4 for constructing sewers. Bd. Pub. Wks.

Mobile, Ala.—Bids will be received until Oct. 17 for constructing a sewerage system. J. C. Brush, mayor.

Marietta, O.—Bids are asked until Oct. 15 for sewers in Fifth Sewer District. Carl Becker, cy. clk.

Cohoes, N. Y.—Sealed proposals will be received until Oct. 12 for constructing sewers. Mayor Mitchell.

Benson, Minn.—Bids are asked until Oct. 7 for constructing a sewer in Utah-ave. Anthon Arneson, vil. rec.

Troy, N. Y.—Bids will be received until Oct. 12 for constructing sewers. E. Ogden Ross, Secy. Pub. Imp. Com'n.

Grand Forks, N. D.—Sealed proposals will be received until Oct. 3 for the construction of 940 ft. of pipe sewers. F. A. Brown, cy. audt.

Marion, Ind.—Sealed proposals will be received until Oct. 4 for constructing sewers and for a drain tile on Park-ave. Cyrus G. Robbins, cy. clk.

Chertsey, England—Plans are asked until Dec. 23 for a sewage disposal plant. The

premiums will be $250, $150 and $100 respectively. T. E. Harland, Chaldecott, clk.

East Cleveland, O.—Sealed proposals will be received until Oct. 10 for the construction of a sewage purification plant and for sewers in a number of streets. H. B. Chapman, vil. clk.

White Earth, Minn.—Sealed proposals will be received until Oct. 4 for the construction of a sewerage and water works system on White Earth Reservation. John H. Sutherland, U. S. Indian Agt.

CONTRACTS AWARDED.

Kansas City, Mo.—Michael Walsh was awarded a sewer contract Sept. 12 for $38,878.70.

Fargo, N. D.—The contract for constructing two miles of sewers has been awarded to James Kennedy, city.

Clinton, Ind.—The contract for constructing a 12-in. sewer has been awarded to J. Robertson of Terre Haute.

Delray, Mich.—The contract for constructing 8,745 ft. of sewer has been awarded to James Grant for $6,000.

Detroit, Mich.—Langley & Jeynes secured the contract Sept. 19 for constructing a new brick sewer for $2,830.

Reedsburg, Vt.—The contract for the Market sewer was awarded to John G. Schuster at 41 cts. a ft.

Iowa City, Ia.—Thomas Hanlon secured the contract for constructing a sewer in alleys of blocks 1 and 9 for $581.10.

Mexico City, Mex.—The contract for sewering the entire city has been awarded to Vesion & Letellier of Paris, France.

Mansfield, O.—Lomax & Hamblin secured contracts Sept. 20 for constructing the Lexington-ave. and E. Johns-st. sewers.

Havana, Ill.—The contract for constructing the sewerage system was awarded to H. G. Bruning, city, for $4,889.75.

Beaver, Pa.—The contract for constructing 4,100 ft. of sewer was awarded to Logan & Shuster, Rochester, Pa., for $4,038.

Billings, Mont.—The contract for building a sewerage system has been awarded to T. R. Hinds & Co. of Butte for $14,000.

Menasha, Wis.—The contract for the Park-st. sewer, 1,760 feet, 12-inch pipe, was awarded Sept. 20 to Patrick Hyland for $602.48.

Savannah, Ga.—The contract for constructing the house drainage system was awarded to Miles & Bradt, Atlanta, for $151,170.90.

Anaconda, Mont.—J. A. Hasley was awarded the contract for constructing sewers in districts Nos. 9 and 12 at $850 and $1,140 respectively.

Richmond, Ind.—John F. Cronin, city, secured the contract Sept. 15 for building the intercepting sewer at $3.67 a lineal foot, or $9,200.

Milwaukee, Wis.—John J. Crilley has been awarded the contract for building the sixth section of the Thirtieth-st. tunnel sewer for $65,528.30.

Crafton, Pa.—Bids were awarded Sept. 20 for constructing 5,140 feet of 8 to 30 inch pipe sewers. The bids ranged from $5,792.68 to $9,051.68.

Oakmont, Pa.—The contract for constructing the sewerage system was awarded Sept. 12 to John Dell and Diulles & Bro., Braddock, Pa., for $36,500.

Shelby, O.—The lowest bid submitted Sept. 19 for building 6½ miles of lateral sewers was that of De Groodt Bros. of Youngstown—$17,000.

Pocomoke City, Md.—The contract for building a sewerage and water works system was awarded Sept. 15 to Van D. Hitesmith, Knoxville, Tenn., for $19,500.

Faribault, Minn.—The lowest bid submitted for building a sewer was that of O'Neil & Son, city, at $9,337, and the highest Engel & Osman, Duluth, at $15,073.

Carbondale, Pa.—The contract for constructing 8-inch sewers on Terrace Wyoming and Washington-sts. and Ninth-ave. was awarded Sept. 7 to John Nolam at 97 cents a lineal foot.

West Newton, Pa.—The contract for furnishing 850 ft. of 24-in. sewer pipe was awarded to the Sharon Sewer Pipe Manufacturing company, Sharon, Pa., and the contract for laying the sewer to Christ Goehring, city.

Toledo, O.—The contract for constructing the Adams-st. sewer was awarded Sept. 15 to Jas. McKinney for $35,285. H. P. Streicher was the lowest bidder Sept. 19 for a 15-in. sewer in the alley between Utah and Yondota-sts., at $936.

Newark, N. J.—The contract was awarded Sept. 22 for a sewer in the annexed district on Clinton-ave.. Headley & Christie, $17,180.75. Bids were received for twelve lateral sewers to connect with the intercepting sewer "Down Neck," but action was postponed for one week.

CONTEMPLATED WORK.

Butte, Mont.—An extension of the Holland-st. sewer has been ordered.

Phoenix, Ariz.—The estimated cost of a sewerage system is $119,000.

Chesapeake City, Md.—The council has voted to build a sewerage system.

Springfield, Mass.—Orders for the construction of sewers have been passed.

Washington, D. C.—Hearings will be given Oct. 5 on the proposed stoneware sewers.

Steubenville, O.—Plans and specifications for sewers have been made by the city engineer.

Chestertown, Md.—The sewerage system is being investigated by the state board of health.

Brookfield, Mo.—This city has voted in favor of the construction of a sewerage system.

Greenville, O.—Ordinances for constructing sewers have been passed. Engineer Beers.

Decatur, Ala.—The construction of a small sewerage system is contemplated. J. E. Edwards, cy. clk.

Santa Ana, Cal.—Contracts for constructing the interior system of sewers will be let in October.

Cicero, Ind.—Specifications have been submitted for constructing sewers. Surveyor Mitchell.

Chester, Pa.—An ordinance for a sewer in Fourth-st. has been approved by Mayor C. M. Black.

Toronto, Ont.—Dr. Sheard, medical health officer, favors a complete filtration system of sewerage.

Spokane, Wash.—The council has ordered a sewer on Pacific-ave., from Spruce to Coeur d'Alene-ave.

Niles, O.—Bids will probably be asked in October for building a sewer one mile long. Wm. Wilson, cy. engr.

East Hartford, Conn.—A consulting engineer will be employed on the proposed trunk sewer.

Wayne, Mich.—The council will secure a surveyor to make surveys for the proposed sewer.

Lyons, N. Y.—The proposition of constructing a sewer on Jackson-st. has been favorably voted on.

Lebanon, O.—The construction of a sewer on Mulberry-st is contemplated. F. M. Hamilton, jr., mayor.

Greenville, Pa.—An ordinance has been passed authorizing the advertising of bids for a new sewer in the Third ward.

Granite City, Ill.—The question of constructing a joint sewerage system is being considered by this city and Madison.

Galesburg, Ill.—A trunk sewer from the Knoxville road to Cedar Fork creek is proposed. M. J. Blanding, cy. engr.

Vicksburg, Miss.—A committee was appointed Sept. 13 to make plans and estimates for a sewerage system for this city.

Monmouth, Ill.—The construction of 6,430 ft. of 12, 15, 42, 24-in. brick sewers is contemplated. M. J. E. Miller, cy. engr.

Berkeley, Cal.—The construction of a sewer on Sixth-st., between Rose and Gilliman-sts., has been recommended by St. Supt. Rowell.

Newburg, N. Y.—The construction of seven blocks of 4-ft. brick sewer, at a cost of $27,000, is contemplated. Chas. A. Caldwell, cy. engr.

San Francisco, Cal.—Plans for a sewerage system adjoining the Presidio reservation on Lyon, Devisadero and adjoining streets have been recommended by the Supervisors' Street Committee. The plans are for a brick oval form sewer, three feet high, provided with a vitrified stone lining set in cement against the bricks and conforming to the oval bottom. It is believed that this lining will cause the brick sewers to last for many years.

WATER-WORKS.

Elyria, O.—The city has purchased the water works plant of the Elyria Gas and Water company for $45,460.48.

Des Moines, Ia.—The proposition to purchase the local water works plant for $850,000 was defeated.

Chattanooga, Tenn.—The new filtration system of the City Water company was put in operation Sept. 15. The system cost $100,000.

Anaconda, Mont.—A suit involving the ownership of the Pocatello water works has been filed by F. D. Towns and J. J. Cusick against James A. Murray.

Boyertown, Pa.—The Boyertown Water company has filed a bill of equity against this borough, asking that it be restrained from erecting its own water works.

New Albany, Ind.—A franchise has been granted to the Home Crystal Water company to furnish water to the city. The city council repudiated an alleged contract with the New Albany Water company.

Worthington, Ind.—An injunction suit has been filed against the town board to restrain the carrying out of the contract with C. S. Knights of Chicago for constructing a water works and electric light system.

Bloomington, Ind.—The sale of the Bloomington water works has been confirmed by the United States court and Henry A. Woolery, special master, has been instructed to execute a deed for the plant to James D. Showers, the purchaser.

Fulton, N. Y.—William R. Hill, M. Am. Soc. C. E., Syracuse, N. Y., has been selected by the water commissioners and George A Clark, Oswego, N. Y., has been engaged by the Fulton Water Works company as experts in the proposed sale of the works to the city.

Kansas City, Mo.—The board of public works has decided to recommend to the city council an ordinance providing a special water rate of 5 cents per 1,000 gallons to all consumers using 10,000,000 gallons each month, and 4 cents for those using 25,000,000 gallons.

Augusta, Me.—A bill, which embraces a plan to unite several municipalities for the purchase of a water supply, will be presented to the next legislature. The purpose of the bill is to unite the towns of Benton, Fairfield, Winslow and Waterville under what shall be known as the Kennebec water district.

Groesbeck, Tex.—The citizens voted to authorize the city council to transfer as a gift to Rod Oliver the entire water works system belonging to this city and worth $13,000 or $14,000. Mr. Oliver, under bond, places himself under obligation to keep it in good order and to maintain and continue to families, business houses, etc., the same rates as charged by the city.

Birmingham, England—The water supply is to be increased upon plans drawn by Jas. Mansergh and Corporation Engineer Gray. Storage dams will be built, storing about 18,000,000 gals. of water and supplying 27,000,000 gals. per day. The plans contemplate a tunnel 6,600 ft. long, leading from one water shed to the other. The estimated total cost is $29,255,000.

Brooklyn, N. Y.—According to a recent report by James Moffett, deputy commissioner of water supply of the borough of Brooklyn, the addition and improvements needed will reach a total cost of $2,900,000. Insufficient conduit capacity has resulted in a waste of millions of gallons of water east of Millburn, and the pumps have often been kept idle, while at other times they are under a great strain. An additional reservoir is contemplated at Forest Park at a cost of $600,000, and filter beds at Baisley's at a cost of $75,000.

Racine, Wis.—The Boston Safe Deposit company, owner of the Racine water works, has asked the United States court for an injunction restraining the city of Racine from destruction of the property. The franchise under which the Racine Water Works company operates expires in 1902, and then the city may purchase, the price to be fixed by arbitration. It is claimed that the citizens as well as the city officials and aldermen are doing everything in their power to depreciate the property, so that the city may purchase it at a price below its real value.

CONTRACTS TO BE LET.

Wagoner, Ind. Ter.—Bids will be received until Oct. 15 for constructing a water works plant.

Greensboro, Ga.—Bids will be received until Oct. 6 for building a water works system. J. B. Williams, mayor.

White Earth, Minn.—Bids will be received

until Oct. 4 for constructing a water works system. John H. Sutherland, U. S. Indian Agt.

Coburg, Ont.—Separate bids will be received until Oct. 31 for a water supply and street lighting system. D. H. Minaker, town clk.

Osage, Ia.—(Special.)—Bids will be received until Oct. 6 for constructing a water works system. I. P. Williams, chrm. water com.; G. H. Merridith, Cedar Rapids, engr.

Eaton Rapids, Mich.—Bids are asked until Oct. 4 for 6 miles of cast iron water pipe, with special castings, hydrants, valves and valve boxes. Jas. H. Gallery, secy. bd. w. w. and elect. light.

Dayton, O.—Bids will be received until Oct. 3 for the construction of the flood gates across the Miami and Erie canal at Apple-st. and setting of gate and construction of necessary masonry at the west end of the Apple-st. sewer. John L. Baker, prest. bd. cy. affairs.

Seattle, Wash.—Bids will be received until Nov. 15 for constructing certain additions to the existing water works system, including a gravity water supply from Cedar River, reservoirs and portions of an auxiliary high service system. Frank Oleson, secy. B. P. W.

CONTEMPLATED WORK.

Perham, Minn.—Plans have been prepared for a water plant.

Sioux Falls, S. D.—A municipal water works system is contemplated.

Irvington, N. Y.—The question of extending the water works will be voted on.

Verdun, Que.—Plans are being made for a water works and sewerage system.

Augusta, Me.—The construction of a reservoir is contemplated. Wm. G. Williams, supt. w. wks.

Water works systems are being agitated at the following places: Williamsport, Md.; Mankato, Minn.

Mabel, Minn.—Petitions have been circulated asking the village council to extend the water mains.

Des Moines, Ia.—The city council has ordered the extension of the water mains in a number of streets.

Centerville, Md.—The question of securing a better water supply is being considered by the town commissioners.

Depew, N. Y.—The question of securing a municipal water supply from Lake Erie is contemplated. Henry W. Box.

Pasadena, Cal.—The question of acquiring a municipal water works system will probably be submitted to a vote.

Reading, Pa.—The question of making a loan for a filtration plant will probably be voted on in November.

Philadelphia, Pa.—The plans for the filtration of the city's water supply will be ready to submit to the councils Oct. 1.

Holyoke, Mass.—An open sand filter, having a capacity of 500,000 gals. a day, has been designed for the water works.

Monroe, La.—The question of issuing bonds for water, sewerage and electric light plants is said to be under discussion.

McKees Rocks, Pa.—The council has decided to make preliminary preparations for the erection of a municipal water works system.

Bradford, Pa.—An ordinance has been ordered published, authorizing the construction of a storage reservoir of 92,000,000 gals. capacity.

Water works bonds have been favorably voted on as follows: Bainbridge, N. Y.; Clare, Ia.; Elmore, Minn.; Condon, Or.; McConnellsville, O.; Jackson, O.

Somerville, Tenn. — (Special) — W. D. Scraggs says $10,000 bonds for a water and light plant have been voted and the contract will be let in the near future.

Baltimore, Md.—The board of public improvements considered the ordinance providing for the construction of filtration plants for the purification of the city's water supply, Sept. 16, but reached no conclusion.

Little Falls, Minn.—A special election will be held Oct. 4 to vote on the proposition to issue $60,000 bonds for the purchase of the present water and electric light plant or for the construction of a new plant.

The question of issuing bonds for water works construction will be voted on as follows: Atlanta, Ga., Oct. 5; Richfield, Utah; Persia, Ia.; San Mateo, Cal.; Mt. Sterling, Ky.; Little Falls, Minn.; Topeka, Kas.

Pueblo, Col.—C. P. Allen, Denver, Col., recommends that a 34-in. wood suction pipe be laid from the pumping station to the reservoirs alongside of the 24-in. cast iron suction pipe already in use. He also recommends more boiler power.

The construction of water works systems is contemplated at the following places: Conneautville, Pa.; Fayetteville, Tenn.; Siddell, Ill.; Whitehall, Ill.; Carson, Ia.; Lakeport, Cal.; Thornton, Ind.; Lewisville, Ind.; Wynne, Ark.; Oto, Ia.

Moline, Ill.—(Special)—Jacob A. Harmon, C. E., Peoria, Ill., has prepared preliminary plans, estimates and report on a water supply improvement. The plans contemplate the construction of natural or slow sand filters having a capacity of 3,000,000 gallons per 24 hours, a distribution reservoir of 5,000,000 gallons, two settling basins of 2,800,000 gallons each, a water tower and tank which has a capacity of 185,000 gallons, a pumping station and about $15,000 or $20,000 worth of mains. It is expected that detail plans and specifications will be ready in January, 1899.

Water Works Contracts Awarded.

Breckenridge, Col.—The contract for constructing a water works system has been awarded to D. Mitchell for $21,400.

Mobile, Ala.—The contract for building the water works system was awarded Sept. 13 to M. T. Lowman & Co. of Louisville, Ky., for $448,747.21.

Albany, N. Y.—The contract for the improvement of Bleecker reservoir was awarded Sept. 20 to E. M. Haines & Co, Rhinebeck, N. Y., for $28,456.

York, Pa.—The York Water company has awarded a contract to the New York Filter company for a filter plant, with 4,000,000 gallons capacity a day, for $100,000.

Wyoming, Ia.—The contract for building the water works system has been awarded to J. L. White of Leonore, Ill., for $2,577.

Columbus, O.—Bids were received Sept. 10 for constructing the proposed dam in the Scioto. The specifications required 5,000 cubic yards of dry earth excavation, 3,500 cubic yards of wet earth excavation, 1,200 cubic yards of rock excavation, 20,000 cubic yards of concrete masonry. The specifications provided, however, for bids on concrete masonry, one bid to include cement and the

other without cement. The bids were as follows: William H. Luchtenberg, with cement, $100,775; without cement, $60,775; Willard & Conwell, with cement, $101,000; without cement, $57,200; S. Casparis, with cement, $127,000; without cement, $46,000; Cleveland Construction company, with cement, $115,300; without cement, $75,300; Greenville Construction company, with cement, $118,450; without cement, $67,350; Houston Construction company, with cement, $118,450; without cement, $65,850; Assurance Construction company, with cement, $114,400; without cement, $62,400. The lowest bid with cement was that of W. H. Luchtenberg, $100,775, and without cement S. Casparis, $46,000.

GARBAGE DISPOSAL.

Santiago, Cuba—The contract for building a garbage plant has been awarded to the Dixon Crematory company.

Milwaukee, Wis.—The aldermen have voted to purchase a garbage plant of the Engle Crematory company for $52,500.

New Orleans, La.—A resolution has been adopted directing the city engineer and commissioner of public works to prepare plans and specifications for the erection of crematories.

Atlantic City, N. J.—The contract for building a Smith-Simon incinerating plant has been awarded to Thomas K. Dalzell, Reading, Pa., for $29,900.

Bridgeport, Conn.—The proposition of Frank E. Clark, president Connecticut Reduction company, to sell the garbage plant to the city, has been rejected.

Phillipsburg, N. J.—The council has voted to build a garbage plant at a cost of $8,500.

Beaver Falls, Pa.—The Keystone Reduction company secured a five-year contract for removing garbage, etc.

Boston, Mass.—The City Refuse Utilization company has been awarded the ten-year contract for disposing of the combustible city refuse. The city retains the option of buying the plant under appraisement at the end of five years.

Syracuse, N. Y.—The block system of street cleaning will be inaugurated for cleaning the paved streets.

Hamilton, O.—The International Sweeping company, Dayton, O., has offered one of their "Pick-up" street cleaning machines to this city for $475.

St. Paul, Minn.—In the annual report of L. W. Rundlett for 1897 the cleaning of asphalt pavements by hand is given considerable attention.

Albany, N. Y.—The contract for removing dirt, awarded recently to Jos. F. Droogan, has been assigned to John G. Wasserbach.

Buffalo, N. Y.—Henry P. Burgard has been awarded the five-year contract for street cleaning, beginning Sept. 15. The bids for the work were received last spring.

Utica, N. Y.—Emmet J. Hurley has been awarded the contract for collecting garbage at $6.445.

Uniontown, Pa.—The purchase of a garbage disposal plant is contemplated.

Louisville, Ky.—The question of building a garbage crematory at a cost of about $10,000 is contemplated

Westchester, Pa.—The purchase of additional street sprinklers is urged by A. M. Eaches, st. comr.

Evansville, Ind.—The contract for sweeping the streets for one year has been awarded to Frank Pritchet at 18 cts. per 10,000 ft.

Marion, Ind.—Plans for rebuilding the burnt garbage disposal plant are being considered.

Denver, Col.—A better method of garbage disposal is desired. Dr. Munn and Supt. Clark of bd. of health.

BRIDGES.

Decatur, Ill.—The Wrought Iron Bridge company, Canton, O., was awarded the contract Sept. 17 for building an iron bridge over Sandy creek, near Shady Grove, for $960.

Chehalis, Wash.—Bids are asked until Oct. 10 for constructing a trestle over the Chehalis river. Albert Schooley, co. audt.

Pekin, Ill.—The Wrought Iron Bridge company, Canton, O., has been awarded the contract for a bridge across the county ditch in Malone twp.

Wichita, Kas.—The construction of a bridge across the Little Arkansas, east of Griswold Park, is contemplated.

Ansonia, Conn.—A brick bridge will be built. Creosoted block will be laid first and covered with two layers of tarred felt. A cushion of sand 1 in. thick will be spread and the bricks set on it.

Burlington, Kas.—Bids are asked until Oct. 4 for three steel bridges. D. K. Swearingen, co. audt.

Waverly, Ia.—Bids are asked until Oct. 3 for a steel bridge over Cedar river. W. Weidilschka, co. audt.

Carpentersville, Ill.—The construction of a steel bridge across the river is contemplated.

Cincinnati, O.—Bids are asked until Oct. 20 for constructing the superstructure and masonry substructure for viaduct over Lick run.

North Baltimore, O.—Bids are asked until Oct. 8 for building a bridge across the Great Miami river. E. L. Lewis, co. audt.

Parker, S. D.—Bids are asked until Oct. 11 for building three steel or combination bridges. Co. audt.

Colfax, Wash.—Bids will be received until Oct. 7 for building a steel or combination bridge across the North Palouse and Union Flat creek. Bd. co. comrs.

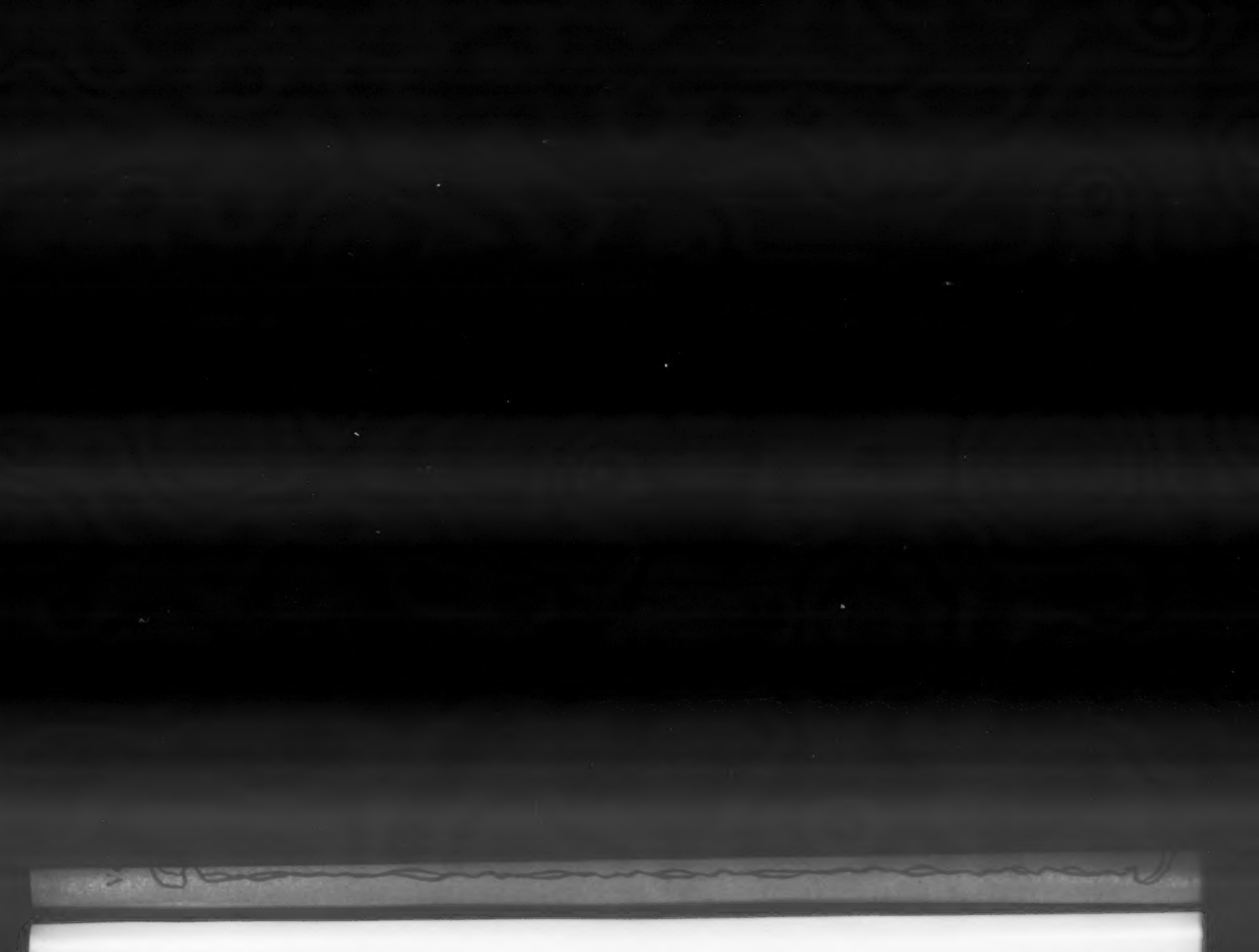
STREET LIGHTING.

Braddock, Pa.—A municipal lighting plant is urged.

Bennett, Pa.—The question of issuing bonds for electric lights will be voted on Nov. 8.

Santa Ana, Cal.—The construction of an electric light plant is contemplated.

St. Joseph, Ill.—Bids are asked until Oct. 6 for an electric light plant. C. W. Gibson, chrm. of com.

Philadelphia, Pa.—Bids will be received until Oct. 4 for electric lighting in 1899; also estimates for a municipal plant.

Greensboro, Ga.—Bids are asked until Oct. 6 for lighting streets with electricity for a period of three or more years. B. H. Merriman, chrm. lgt. com.